

CURRICULUM VITAE: LAURENCE C. SMITH

Effective July 1, 2019 Laurence C. Smith became the John Atwater and Diana Nelson Chair of Environmental Studies in the Institute at Brown for Environment & Society (IBES) and the Department of Earth, Environmental and Planetary Sciences (DEEPS) at Brown University. Before then he was Professor and Chair of Geography at the University of California, Los Angeles (UCLA), serving as Department Chair 2013-2017. He also held a joint appointment in the Department of Earth, Planetary, and Space Sciences at UCLA. His research interests include the Arctic, water resources, and satellite remote sensing technologies. He has published over 100 peer-reviewed articles, essays and books including in the journals *Science*, *Nature*, and *PNAS*, and won more than \$9M in research funding from the National Science Foundation and NASA. In 2006-2007 he was named a Guggenheim Fellow by the John S. Guggenheim Foundation. In 2007 and 2014 his work appeared prominently in 4th and 5th Assessment Reports of the United Nations' Intergovernmental Panel on Climate Change (IPCC). In 2015, he was elected Fellow of the American Geophysical Union (AGU). He is currently assisting NASA with a new satellite mission to monitor global water resources, and the World Economic Forum with social science issues of Arctic development. In 2012, 2014, 2016 was an invited speaker at the World Economic Forum in Davos.

His general-audience book *THE WORLD IN 2050: Four Forces Shaping Civilization's Northern Future* (Plume: New York, 2011; U.K. edition titled *THE NEW NORTH*, Profile: London, 2011 with translations in 14 languages) synthesizing cross-cutting trends in natural resource demand, demographics, globalization, and climate change with emphasis on northern countries was winner of the Walter P. Kistler Book Award and a *NATURE* Editor's Pick of 2012. His next book, *RIVERS OF POWER* about rivers and civilization will be published in 2020 (Little Brown and Company USA/Canada; Penguin Press U.K.; plus overseas translation editions). His research has received coverage in *The New York Times*, *The Wall Street Journal*, *The Economist*, *The Los Angeles Times*, *The Washington Post*, *The Globe and Mail*, *The Financial Times*, *Discover Magazine*, *NPR*, *CBC Radio*, *BBC* and others.

EDUCATION

- Ph.D. Cornell University** (1996) *Department of Earth and Atmospheric Sciences, Ithaca, New York*
- M.S. Indiana University** (1991) *Department of Geological Sciences, Bloomington, Indiana*
- B.S. University of Illinois** (1989) *Department of Geology, Urbana-Champaign, Illinois*

PROFESSIONAL HISTORY

- John Atwater and Diana Nelson
Chair of Environmental Studies**
2019-
Chair, Dept. of Geography
2013-2017
Professor
2006 – 2019
Associate Professor
- Brown University
Department of Earth, Environmental and Planetary Sciences (DEEPS); Institute at Brown for Environment & Society (IBES)
 - Chair of the UCLA Department of Geography
 - UCLA Department of Geography, with additional 0 FTE joint appointment in the Department of Earth & Space Sciences
 - UCLA Department of Geography, with additional 0 FTE joint

2002 – 2006

appointment in the Department of Earth & Space Sciences

Assistant Professor

• UCLA Department of Geography

1996 – 2002

Hydrologist

• U.S. Geological Survey, Water Resources Division,
Indianapolis, Indiana

1991 – 1992

HONORS

AGU Fellow

American Geophysical Union

(2015) For “individual AGU members who have made exceptional scientific contributions and attained acknowledged eminence in the fields of Earth and space sciences” and bestowed “on only 0.1 percent of the membership in any given year” see <http://news.agu.org/press-release/american-geophysical-union-announces-2015-fellows/>

PNAS Top 10 Story of 2013

Proceedings of the National Academy of Sciences

(2013) paper “New Trans-Arctic shipping routes navigable by midcentury” was selected by PNAS as one of its top ten of the year, see <http://www.pnas.org/site/media/topten2013.xhtml>

Best Analytic Presentation (First Place)

Esri User Conference

(2013) Map competition winner for “New Trans-Arctic shipping routes navigable by midcentury” See <http://www.esri.com/events/user-conference/participate/map-gallery-results>

AAAS John Wesley Powell Lecturer

American Association for the Advancement of Science

(2012) Honorary annual lecture in memory of John Wesley Powell, AAAS Southwestern and Rocky Mountain Division

Walter P. Kistler Book Award

Foundation for the Future

(2012) Annual award to “recognize authors of science-based books that significantly increase the knowledge and understanding of the public regarding the future of our species”

Woo Lecturer

CMOS-CGU Joint Congress

(2010) Honorary named lecture to the 3rd Joint Congress of the Canadian Meteorological and Oceanographic Society and the Canadian Geophysical Union.

Bellagio Residency

The Rockefeller Foundation

(2007) One-month residency for scholars who “demonstrate a history of significant achievement in their respective fields.” See <http://www.rockefellerfoundation.org/bellagio-center/residency-program>

Guggenheim Fellow

John S. Guggenheim Foundation, New York

(2006-07) Annual award for “distinguished achievement in the past and exceptional promise for future accomplishment” For more information see <http://www.gf.org/>

<i>Discover Magazine Top 100</i>	Discover Magazine (January 2006) Annual award for “the Top 100 Science Stories of the Year” (2005). For more information see http://discovermagazine.com/2006/jan/environment/
<i>AGU Frontier Lecturer</i>	American Geophysical Union (2005) Honorary keynote “ <i>Arctic Change and the New Global Hydrology</i> ,” AGU Fall Meeting, San Francisco
<i>NASA New Investigator</i>	National Aeronautics and Space Administration (2000) Career development award for tenure-track faculty
<i>UCLA Career Development Award</i>	University of California, Los Angeles (2000) Career development award for promising junior faculty
<i>Outstanding Student Paper</i>	American Geophysical Union (1995) For description, see <i>Eos, Trans. AGU</i> 76(36), 1995.
<i>Graduate Student Researchers Program Fellow</i>	National Aeronautics and Space Administration (1994) Three years of Ph.D. tuition/stipend support
<i>Robert K. Fahnestock Memorial Award</i>	Geological Society of America (1994) Annual award to the ‘most outstanding student research proposal in Geomorphology.’ See <i>GSA TODAY</i> 4(9), 1994.
<i>Most Outstanding Graduate Student</i>	(1993) Cornell University Annual award in the Dept. of Earth and Atmospheric Sciences.

PEER-REVIEWED JOURNAL PUBLICATIONS (* mentored paper) (Total 106)

106. PIETRONIRO, A., PETERS, D.L., YANG, D., FISET, J.-M., SAINT-JEAN, R., FORTIN, V., LECONTE, R., BERGERON, J., SILES, G.L., TRUDEL, M., GARNAUD, C., MATTE, P., SMITH, L.C., GLEASON, C.J., PAVELSKY, T.M. (2019) Canada’s Contributions to the SWOT Mission–Terrestrial Hydrology (SWOT-CTH). *Canadian Journal of Remote Sensing*, <https://doi.org/10.1080/07038992.2019.1581056>
 105. YANG, K., SMITH, L.C., SOLE, A., LIVINGSTONE, S.J., CHENG, X., CHEN, Z., MANCHUN, L. (2019) Supraglacial rivers on the northwest Greenland Ice Sheet, Devon Ice Cap, and Barnes Ice Cap mapped using Sentinel-2 imagery. *International Journal of Applied Earth Observation and Geoinformation*, 78, 1–13, <https://doi.org/10.1016/j.jag.2019.01.008>
 104. *PITCHER, L.H., AND SMITH, L.C. (2019) Supraglacial Streams and Rivers. *Annual Review of Earth and Planetary Sciences* 47:1, 421-452, <https://doi.org/10.1146/annurev-earth-053018-060212>
 103. ALTENAU, E.H., PAVELSKY, T.M., MOLLER, D., PITCHER, L.H., BATES, P.D., DURAND, M.T. AND SMITH, L.C. (2019) Temporal variations in river water surface elevation and slope captured by AirSWOT. *Remote Sensing of Environment* 224, 304-316 <https://doi.org/10.1016/j.rse.2019.02.002>
 102. *PITCHER, L.H., PAVELSKY, T.M., SMITH, L.C., MOLLER, D.K., ALTENAU, E.H., ALLEN, G.H., LION, C., BUTMAN, D., COOLEY, S.W., FAYNE, J., BERTRAM, M. (2019) AirSWOT InSAR mapping of surface water elevations and hydraulic gradients across the Yukon Flats Basin, Alaska. *Water Resources Research*, 55, 937– 953. <https://doi.org/10.1029/2018WR023274>
 101. *RYAN, J.C., SMITH, L.C., VAN AS, D., COOLEY, S.W., COOPER, M.G., PITCHER, L.H., HUBBARD, A. (2019) Greenland Ice Sheet surface melt amplified by snowline migration and bare ice exposure *Science Advances* 5(3), eaav3738, DOI: 10.1126/sciadv.aav3738
- This article featured as a *Nature* Research Highlight “Greenland’s snow cover will help to determine ice sheet’s fate”, <https://www.nature.com/articles/d41586-019-00785-8>

100. *COOLEY, S. W., SMITH, L. C., RYAN, J. C., PITCHER, L. H., & PAVELSKY, T. M. (2019). Arctic-Boreal lake dynamics revealed using CubeSat imagery. *Geophysical Research Letters*, 46. <https://doi.org/10.1029/2018GL081584>
99. *YANG, K., SMITH, L.C., SOLE, A., LIVINGSTONE, S.J., CHENG, X., CHEN, Z., LI, M., Supraglacial rivers on the northwest Greenland Ice Sheet, Devon Ice Cap, and Barnes Ice Cap mapped using Sentinel-2 imagery (2019). *International J. Applied Earth Observation and Geoinformation*, 78, <https://doi.org/10.1016/j.jag.2019.01.008>
98. *YANG, K., SMITH, L.C., KARLSTROM, L., COOPER, M.G., TEDESCO, M., VAN AS, D., CHENG, X., CHEN, Z., LI, M. (2018), A new surface meltwater routing model for use on the Greenland Ice Sheet surface , *The Cryosphere* 12, 3791-3811, <https://doi.org/10.5194/tc-12-3791-2018>.
96. *COOPER, M.G, SCHAPEROW, J.R, COOLEY, S.W, ALAM, S., SMITH, L.C. LETTENMAIER, D.P. (2018) Climate Elasticity of Low Flows in the Maritime Western US Mountains, *Water Resources Research* 54, DOI:10.1029/2018WR022816
95. RYAN, J.C., HUBBARD, A., STIBAL, M., IRVINE-FYNN, T.D., COOK, J., SMITH, L.C., CAMERON, K., BOX, J. (2018) Dark zone of the Greenland Ice Sheet controlled by distributed biologically-active impurities, *Nature Communications*, 1065, doi:10.1038/s41467-018-03353-2
97. *COOPER, M. G., SMITH, L. C., RENNERMALM, A. K., MIEGE C., PITCHER, L. H, RYAN, J. C., YANG, K., AND COOLEY, S. (2018), Near surface meltwater storage in low-density bare ice of the Greenland ice sheet ablation zone, *The Cryosphere*, 12, 955-970, <https://doi.org/10.5194/tc-12-955-2018>
94. *COOLEY, S.W., SMITH, L.C., STEPAN, L., MASCARO, J. (2017) Tracking Dynamic Northern Surface Water Changes with High-Frequency Planet CubeSat Imagery. *Remote Sensing* 9(12), 1306, doi:10.3390/rs9121306
93. SMITH, L.C., YANG, K., PITCHER, L.H, OVERSTREET, B.T., CHU, V.W., RENNERMALM, Å.K., RYAN, J.C., COOPER, M.G., GLEASON, C.J., TEDESCO, M., JEYARATNAM, J., VAN AS, D. VAN DEN BROEKE, M.R., VAN DE BERG, W.J., NOËL, B., LANGEN, P.I, CULLATHER, R.I, ZHAO, B., WILLIS, M.J., HUBBARD, A., BOX, J.E., JENNER, B.A., BEHAR, A.E. (2017). Direct measurements of meltwater runoff on the Greenland Ice Sheet surface, *Proceedings of the National Academy of Sciences (PNAS)* 114 (50) E10622-E10631; doi:10.1073/pnas.1707743114 (freely available at <http://www.pnas.org/content/114/50/E10622.full.pdf>)
92. ALTENAU, E. H., T. M. PAVELSKY, D. MOLLER, C. LION, L. H. PITCHER, G. H. ALLEN, P. D. BATES, S. CALMANT, M. DURAND, AND L. C. SMITH (2017), AirSWOT measurements of river water surface elevation and slope: Tanana River, AK, *Geophysical Research Letters*, 44, 181–189, doi:10.1002/2016GL071577.
91. RYAN J.C., HUBBARD A., BOX J.E., BROUGH S., CAMERON K., COOK J.M., COOPER M., DOYLE S.H., EDWARDS A., HOLT T., IRVINE-FYNN T., JONES C., PITCHER L.H, RENNERMALM A.K., SMITH L.C., STIBAL M. AND SNOOKE N. (2017) Derivation of High Spatial Resolution Albedo from UAV Digital Imagery: Application over the Greenland Ice Sheet. *Front. Earth Sci.* 5:40. doi: 10.3389/feart.2017.00040
90. MOUSTAFA, S.E., RENNERMALM, A.K, ROMAN, M.O, WANG, Z., SCHAAF, C.B., SMITH, L.C., KOENIG, L.S., AND A. ERB, (2017), Evaluation of satellite remote sensing albedo retrievals over the ablation area of the southwestern Greenland ice sheet, *Remote Sens. Environment* 198, 115-125, <https://doi.org/10.1016/j.rse.2017.05.030>
89. *BENNETT, M.M., AND SMITH, L.C. (2017), Using multitemporal night-time lights data to compare regional development in Russia and China, 1992–2012, *International Journal of Remote Sensing*, DOI: 10.1080/01431161.2017.1312035
88. *BENNETT, M.M., AND SMITH, L.C. (2017), Advances in using multitemporal night-time lights satellite imagery to detect, estimate, and monitor socioeconomic dynamics. *Remote Sensing of Environment* 192, 176-197, <http://dx.doi.org/10.1016/j.rse.2017.01.005>
87. *YANG, K., KARLSTROM, L., SMITH, L. C., AND LI, M. (2017), Automatic High Resolution Satellite Image Registration Using Supraglacial Rivers on the Greenland Ice Sheet. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (JSTARS)*, vol. 10(3), DOI: 10.1109/JSTARS.2016.2617822
86. *PITCHER, L.H, SMITH, L.C., GLEASON, C.J., YANG, K., CryoSheds: a GIS modeling framework for delineating land-ice watersheds for the Greenland Ice Sheet (2016). *GIScience & Remote Sensing* DOI:10.1080/15481603.2016.1230084)
85. *YANG, K., AND SMITH, L.C. (2016), Internally drained catchments dominate supraglacial hydrology of the southwest Greenland Ice Sheet, *J. Geophysical Res. Earth Surf.*, 121, DOI: 10.1002/2016JF003927

84. *GLEASON, C. J., **SMITH, L. C.**, CHU, V. W., LEGLEITER, C. J., PITCHER, L. H., OVERSTREET, B. T., RENNERMARM, A. K., FORSTER, R. R., AND YANG, K. (2016), Characterizing supraglacial meltwater channel hydraulics on the Greenland Ice Sheet from *in situ* observations. *Earth Surface Processes and Landforms*, doi: [10.1002/esp.3977](https://doi.org/10.1002/esp.3977).
83. DURAND, M., GLEASON, C.J., GARAMBOIS, P.A., BJERKLIE, D., **SMITH, L. C.**, ROUX, H., RODRIGUEZ, E., BATES, P. D., PAVELSKY, T. M., MONNIER, J., CHEN, X., DI BALDASSARRE, G., FISET, J.-M., FLIPO, N., FRASSON, R. P. D. M., FULTON, J., GOUTAL, N., HOSSAIN, F., HUMPHRIES, E., MINEAR, J.T., MUKOLWE, M.M., NEAL, J.C., RICCI, S., SANDERS, B.F., SCHUMANN, G., SCHUBERT, J.E., VILMIN, L. (2016), An intercomparison of remote sensing river discharge estimation algorithms from measurements of river height, width, and slope, *Water Resources Research*, 52, 4527–4549, doi:[10.1002/2015WR018434](https://doi.org/10.1002/2015WR018434).
82. *YANG, K., **SMITH, L.C.**, CHU, V.W., PITCHER, L.H., GLEASON, C.J., RENNERMARM, A.K., AND LI, M. (2016), Fluvial morphometry of supraglacial river networks on the southwest Greenland Ice Sheet, *GIScience & Remote Sensing*, DOI: 10.1080/15481603.2016.1162345
81. STEPHENSON, S. R. AND **SMITH, L. C.** (2015), Influence of climate model variability on projected Arctic shipping futures. *Earth's Future*, 3, 331–343, doi:10.1002/2015EF000317
80. *YANG, K., **SMITH, L.C.**, CHU, V.W., GLEASON, C.J., AND LI, M. (2015), A Caution on the Use of Surface Digital Elevation Models to Simulate Supraglacial Hydrology of the Greenland Ice Sheet, *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* (JSTARS), 8(11), 5212-5224, DOI: 10.1109/JSTARS.2015.2483483
79. *GLEASON, C.J., **SMITH, L.C.**, FINNEGAN, D.C., LEWINTER, A.L., PITCHER, L.H. AND V.W. CHU (2015), Technical Note: Semi-automated effective width extraction from time-lapse RGB imagery of a remote, braided Greenlandic river, *Hydrol. Earth Syst. Sci.*, 19, 2963-2969, www.hydrol-earth-syst-sci.net/19/2963/2015/, doi:10.5194/hess-19-2963-2015
78. **SMITH, L.C.**, CHU, V.W., YANG, K., GLEASON, C.J., PITCHER, L.H., RENNERMARM, A.K., LEGLEITER, C.J., BEHAR, A.E., OVERSTREET, B.T., MOUSTAFA, S.E., TEDESCO, M., FORSTER, R.R., LEWINTER, A.L., FINNEGAN, D.C., SHENG, Y., BALOG, J. (2015), Efficient meltwater drainage through supraglacial streams and rivers on the southwest Greenland ice sheet, *Proc. Nat. Acad. Sci.* (PNAS), 112(4), 1001-1006, <http://www.pnas.org/content/112/4/1001.full.pdf+html>
77. MOUSTAFA, S. E., RENNERMARM, A.K., **SMITH, L.C.**, MILLER, M.A., MIODUSZEWSKI, J.R., HOM, M.G., AND C.A. SHUMAN (2015) Multi-modal albedo distributions in the ablation area of the southwestern Greenland Ice Sheet. *The Cryosphere*, 9, 905-923, <http://www.the-cryosphere.net/9/905/2015/tc-9-905-2015.pdf>, doi:10.5194/tc-9-905-2015.
76. *GLEASON, C.J., **SMITH, L.C.**, LEE, J. (2014) Retrieval of river discharge solely from satellite imagery and at-many-stations hydraulic geometry: Sensitivity to river form and optimization parameters. *Water Resources Research*, 50(12), 9604-9619, doi: 10.1002/2014WR016109
75. *GLEASON, C.J., AND **SMITH, L.C.** (2014) Toward global mapping of river discharge using satellite images and at-many-stations hydraulic geometry. *Proc. Nat. Acad. Sci* (PNAS), 111 (13), 4788-4791 doi:10.1073/pnas.1317606111.
74. LEGLEITER, C., TEDESCO, M., **SMITH, L.C.**, BEHAR, A.E., AND OVERSTREET, B.T. (2014) Mapping the bathymetry of supraglacial lakes and streams on the Greenland ice sheet using field measurements and high-resolution satellite images. *The Cryosphere* 8, 215-228, doi:10.5194/tc-8-215-2014 (freely available from <http://www.the-cryosphere.net/8/215/2014/tc-8-215-2014.html>)
73. DURAND, M., NEAL, J., RODRIGUEZ, E., ANDREADIS, K.M., **SMITH, L.C.**, AND YOON, Y. (2014) Estimating reach-averaged discharge for the River Severn from measurements of river water surface elevation and slope. *Journal of Hydrology* 511, 92-104, <http://dx.doi.org/10.1016/j.jhydrol.2013.12.050>.
72. *STEPHENSON, S.R., BRIGHAM, L.W., **SMITH, L.C.**, (2014), Marine accessibility along Russia's Northern Sea Route. *Polar Geography*, 37(2), 111-133, DOI: 10.1080/1088937X.2013.845859
71. LYONS, S.R., SHENG, Y., **SMITH, L.C.**, LI, J., HINKEL, K.M., LENTERS J.D., WANG, J. Quantifying sources of error in multitemporal multisensor lake mapping, *International Journal of Remote Sensing* 23(22), 7887-7905, DOI: 10.1080/01431161.2013.8273432013 (published online 23 Sept, 2013, <http://www.tandfonline.com/doi/abs/10.1080/01431161.2013.827343#UrSN7rR0aYQ>)
70. *MERSEL, M.K., **SMITH, L.C.**, ANDREADIS, K.M., DURAND, M.T., Estimation of river depth from remotely sensed hydraulic relationships. *Water Resources Research* 49, 3165-3179, DOI: 10.1002/wrcr.20176, 2013.
69. **SMITH, L.C.**, AND S.R. STEPHENSON, New Arctic shipping routes navigable by midcentury, *Proc. Nat. Acad. Sci. (PNAS)* 110(13) E1191–E1195, doi:10.1073/pnas.1214212110, 2013.

68. *YANG, K. AND **SMITH, L. C.**, Supraglacial Streams on the Greenland Ice Sheet Delineated From Combined Spectral-Shape Information in High-Resolution Satellite Imagery. *IEEE Geoscience and Remote Sensing Letters* 10(4), 801–805, doi:10.1109/LGRS.2012.2224316, 2013.
67. RENNERMALM, A.K., MOUSTAFA, S.E., MIODUSZEWSKI, J., CHU, V.W., FORSTER, R.R., HAGEDORN, B., HARPER, J.T., MOTE, T.L., ROBINSON, D.A., SHUMAN, C.A., **SMITH L.C.**, AND TEDESCO, M., Understanding Greenland ice sheet hydrology using an integrated multi-scale approach. *Environmental Research Letters*, 8(1) 015017, doi:10.1088/1748-9326/8/1/015017, 2013.
66. HUGELIUS G, BOCKHEIM JG, CAMILL, P, ELBERLING B, GROSSE G, HARDEN JW, JOHNSON K, JORGENSON T, KOVEN C, KUHYRY P, MICHAELSON G, MISHRA U, PALMTAG J, PING C-L, O'DONNELL J, SCHIRRMESTER L, SCHUUR EAG, SHENG Y, **SMITH LC**, STRAUSS J, YU Z. (2013) A new dataset for estimating organic carbon storage to 3m depth in soils of the northern circumpolar permafrost region. *Earth System Science Data*, 5, 393–402, doi:10.5194/essd-5- 393-2013.
65. *STEPHENSON, S.R., **SMITH, L.C.**, BRIGHAM, L.W., AND J.A. AGNEW, Projected 21st-century changes to Arctic marine access, *Climatic Change* 118(3), 885-899, DOI 10.1007/s10584-012-0685-0, 2013.
64. RENNERMALM, A. K., **SMITH, L. C.**, CHU, V. W., BOX, J. E., FORSTER, S. K., AND VAN DEN BROEKE, M. R. Evidence of meltwater retention within the Greenland ice sheet. *The Cryosphere Discussions*, 6(4), 3369–3396. doi:10.5194/tcd-6-3369-2012, 2012.
63. RENNERMALM, A. K., **SMITH, L. C.**, CHU, V. W., FORSTER, S. K., BOX, J. E., AND HAGEDORN, B. Proglacial river stage, discharge, and temperature datasets from the Akuliarusiarsuup Kuua River northern tributary, Southwest Greenland, 2008–2011. *Earth System Science Data*, 4(1), 1–12. doi:10.5194/essd-4-1-2012, 2012.
62. **SMITH, L. C.**, BEILMAN, D.W., KREMENETSKI, K.V., MACDONALD, G.M. SHENG, Y., LAMMERS R.B., SHIKLOMANOV, A.I. AND E.D. LAPSHINA, Influence of permafrost on water storage in West Siberian peatlands revealed from a new database of soil properties, *Permafrost and Periglacial Processes*, 23, 69-79, DOI: 10.1002/ppp.735, 2012.
61. *CHU, V.W., **SMITH, L.C.**, RENNERMALM, A.K., FORSTER, R.R., J.E. BOX, Hydrologic controls on coastal suspended sediment plumes around the Greenland Ice Sheet, *The Cryosphere*, 6, 1–19, www.the-cryosphere.net/6/1/2012/, doi:10.5194/tc-6-1-2012, 2012.
60. *STEPHENSON, S.R., **SMITH, L.C.**, AND J.A. AGNEW, Divergent long-term trajectories of human access to the Arctic, *Nature Climate Change* 1, 156–160, doi:10.1038/nclimate1120, 2011
59. VELICHKO, AA., TIMIREVA, S.N., KREMENETSKI, K.V., MACDONALD, G.M AND **L.C. SMITH**, West Siberian Plain as a late glacial desert, *Quaternary International* 237, 45-53, doi:10.1016/j.quaint.2011.01.013, 2011.
58. **SMITH, L.C.**, Agents of Change in the New North, *Eurasian Geography and Economics* 52(1), 30–55, DOI: 10.2747/1539-7216.52.1.30., 2011.
57. BURGESS, E.W., FORSTER, R.R., BOX, J.E., MOSELEY-THOMPSON, E., BROMWICH, D.H., BALES, R.C. AND **L.C. SMITH**, A Spatially calibrated model of annual accumulation rate on the Greenland Ice Sheet (1958–2007), *Journal of Geophysical Research* 115, F02004, doi:10.1029/2009JF001293, 2010.
56. *CHU, V.W., **SMITH, L.C.** RENNERMALM, A.K., FORSTER, R.R., BOX, J.E., AND N. REEH, Sediment plume response to surface melting and supraglacial lake drainages on the Greenland ice sheet, *J. Glaciology* 55(194), 1072-1082, 2009.
55. **SMITH, L.C.**, AND T.M. PAVELSKY, Remote sensing of volumetric storage changes in lakes, *Earth Surface Processes and Landforms* 34 (Special Issue on Remote Sensing of Rivers), 1353-1358, 2009.
54. *PAVELSKY, T.M., AND **L.C. SMITH**, Remote sensing of suspended sediment concentration, flow velocity, and lake recharge in the Peace-Athabasca Delta, Canada, *Water Resources Research*, 45, W11417, doi:10.1029/2008WR007424, 2009.
53. *LEWIS, S.M., AND **L.C. SMITH**, Hydrologic drainage of the Greenland Ice Sheet. *Hydrological Processes* 23, 2004-2011, doi:10.1002/hyp.7343, 2009.
52. *RENNERMALM, A.K., **SMITH, L.C.** STROEVE, J.C., AND V.W. CHU, Does sea ice influence Greenland ice sheet surface-melt? *Environmental Research Letters* 4, 024011, doi:10.1088/1748-9326/4/2/024011, 2009.
51. BEILMAN, D.W., MACDONALD, G.M., **SMITH, L. C.**, AND P.J. REIMER, Carbon accumulation in peatlands of West Siberia over the last 2000 years, *Global Biogeochemical Cycles* 23, GB1012, doi:10.1029/2007GB003112, 2009.
50. **SMITH, L.C.**, AND T.M. PAVELSKY, Estimation of river discharge, propagation speed, and hydraulic geometry from space: Lena River, Siberia. *Water Resources Research* 44, W03427 doi:10.1029/2007WR006133, 2008.

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SMITH, L.C., *Annual Meeting of the New Champions*, World Economic Forum, Dalian, People's Republic of China, 14-16 September, 2011.

SMITH, L.C., SWOT discharge, *Surface Water and Ocean Topography Meeting*, Washington, D.C., 24-26 August, 2011.

SMITH, L.C., MERSEL, M.K., DURAND, M., ANDREADIS, K. (INVITED), Towards remote sensing of river discharge from space, *AGU 2010 Fall Meeting*, San Francisco, 13-17 December, 2010.

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SMITH, L.C. The Circumpolar North in 2050: A Thought Experiment, *Annual Meeting, Association of American Geographers*, Washington D.C. 14-18 April, 2010.

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SMITH, L.C. (INVITED) 20th century trends in the Russian hydrologic cycle, *AGU 2007 Fall Meeting*, San Francisco, 10-14 December, 2007.

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FUNDED GRANTS WITH SMITH AS THE PRINCIPAL INVESTIGATOR (TOTAL: \$7,109,140)

- (PI) NASA CRYOSPHERE PROGRAM (7/1/19-6/30/21) **\$867,494**
Representing surface meltwater runoff in Greenland ice sheet models (grant #TBD, PI Smith, Co- Lauren Andrews, I's Adam LeWinter, Asa Rennermalm) This three-year study will use remote sensing and remote river gauging installations in northern Greenland to develop improved models of meltwater runoff contributions to ice sheet sliding velocity and global sea level rise (0.5 – 1.25 mo./yr)
- (PI) NASA CRYOSPHERE PROGRAM (7/1/19-6/30/21) **\$474,854**
Dynamic northern rivers assessed with high-frequency CubeSat imagery (grant #TBD, PI L. Smith). This three-year study will use high-resolution, high-frequency Planet CubeSat imagery to assess surface water dynamics in northern Canada and Alaska, with particular focus on the little-studied Canadian Shield (0.25-1.25 mo./yr)
- (PI) NASA Terrestrial Ecology (1/1/17-12/31/2019) **\$933,800**
Sensitivity of Arctic-Boreal surface water to permafrost state (grant NNX17AC60A, PI L. Smith, Co-I Tamlin Pavelsky). This flight project will fly the NASA AirSWOT Ka-band radar interferometer over Canada and Alaska as part of the NASA ABoVE campaign (<https://above.nasa.gov/>) to conduct experimental remote sensing mapping of lakes and rivers (1.0 mo./yr)
- (PI) NASA ROSES - SWOT Science Definition Team (4/4/2016-4/3/2020) **\$744,348**
U.S.-Canada collaboration to build SWOT calibration/validation and science capacity in northern rivers and wetlands (grant NNX16AH83G, PI L. Smith, Co-I A. Pietroniro, C. Gleason). This is a four-year appointment to the SWOT Science Definition Team, to aid prelaunch planning for the NASA/CNES/CSA SWOT satellite mission (0.5 - 1.0 mo./yr)
- (PI) NASA CRYOSPHERE PROGRAM (9/1/2014-8/31/2017) **\$777,738**
Drainage efficiency of the Greenland supraglacial river network (grant NNX14AH93G, PI Smith, Co-I Rennermalm) This three-year study used high-resolution WorldView-1/2/imagery, field measurements, and hydrologic modeling of the hydraulic drainage efficiency of large supraglacial river networks to advance scientific understanding of meltwater transport from the Greenland ice sheet to the global ocean (0.25 – 1.25 mo./yr)
- (PI) NASA Surface Water and Ocean Topography (SWOT) mission (2013-2016) **\$169,069**
Hydrology expertise for the Surface Water and Ocean Topography (SWOT) Science Definition Team [grant NNX13AD88G] (PI Smith, 1/08/2013-1/07/2016). This proposal supports a 3-year appointment to the SWOT Science Definition Team to aid prelaunch planning for this satellite mission (1 mo./yr)
- (PI) NASA REMOTE SENSING THEORY PROGRAM (2011 – 2014) **\$348,414**
“Towards Remote Sensing of River Discharge from Space” [grant NNX12AB41G] (PI Smith) This three-year study will develop theoretical approaches for remotely-sensed estimates of river discharge (1 mo./yr)
- (PI) NASA CRYOSPHERIC SCIENCES PROGRAM (2011 – 2014) **\$658,014**
“Towards hydrologic understanding of the Greenland Ice Sheet” [grant NNX11AQ38G] (PI L. Smith, Co-I's A. Rennermalm, Y. Sheng) This three-year study will examine supraglacial meltwater hydrologic processes on the Greenland ice sheet, including ephemeral drainage networks, lake drainages, and hydrologic outflows to terrestrial rivers, using geophysical remote sensing and in situ field campaigns (1 mo./yr)
- (PI) NASA TERRESTRIAL HYDROLOGY PROGRAM (2010) **\$37,034**
“Salton Sea Instrument cluster for in situ validation of MODIS water-quality products” [grant NNX10AB01G] (PI L. Smith). This one-year study installed in-situ water-quality monitoring equipment in California's largest inland lake, the Salton Sea, for the purpose of obtaining a benchmark calibration dataset for assessment of remotely-sensed water quality parameters (0 mo./yr)
- (PI) NASA CRYOSPHERIC SCIENCES PROGRAM (2005 – 2008) **\$300,987**
“Understanding ice-sheet elevation change: How much goes to the ocean?” [grant NNG05GN89G]

(PI L. Smith, Co-I's R. Forster, N. Reeh) This three-year study studied hydrologic processes on the Greenland ice sheet, including the influence of offshore sea-ice on surface melting, mapping of hydrologic "potentiometric drainage basins" within the ice sheet, and tracking of meltwater river outflows via remote sensing of turbid sediment plumes in estuaries. (1 mo./yr)

(PI) NASA TERRESTRIAL HYDROLOGY PROGRAM (2005 – 2008) **\$387,297**
"Area-stage relationships in rivers and wetlands: Tracking the high-latitude water cycle and provision of core knowledge requirements for a Surface Water satellite mission" [grant NNG06GE05G] (PI L. Smith)
This three-year study examined storages and fluxes of surface water around the northern hemisphere and in low-relief environments, using *in situ* and remotely sensed data. Study sites included the Peace-Athabasca Delta, Canada, and the Lena Rivers, Russia. (1 mo./yr)

(PI) NATIONAL SCIENCE FOUNDATION, OFFICE OF POLAR PROGRAMS (3/01/03-3/01/06) **\$592,114**
"River discharge from the Russian Federation: An understanding of contemporary trends and their placement in a Holocene context" (L. Smith, G. MacDonald (UCLA), Lammers (UNH)). This three year "data rescue" project created a new digital database of daily Russian river discharge, based on compilation and digitizing of extensive historical records currently archived in Russia. These data were then used to assess the source and timing of a recently discovered increase in Eurasian terrestrial runoff, with dendrochronology used to place these 20th century discharge increase in a longer Holocene context.

(PI) NASA NEW INVESTIGATOR PROGRAM (7/01/01-7/01/04) **\$211,520**
"Detection and modeling of mechanical ice break-up in large polar rivers with SAR interferometry" (L. Smith) This three-year developed new radar remote sensing methods (SAR interferometry, radar scatterometer, and MODIS) to study river-ice conditions on the major polar rivers of Russia and Canada.

(PI) NATIONAL SCIENCE FOUNDATION, OFFICE OF POLAR PROGRAMS (6/01/99-6/01/02) **\$752,261**
"Sensitivity of the West Siberian Lowland to Past and Present Climate" (L. Smith, G. MacDonald, A. Velichko) This three-year field study involved data collection from hundreds of sites across extensive peatlands, streams and rivers of Russia's West Siberian Lowland. Radiocarbon dating of peat cores and remotely sensed imagery were used to relate Holocene evolution of these peatlands to atmospheric levels of methane as measured in ice cores. Stream geochemistry samples were used to show how climate warming and associated permafrost thaw will trigger increases in biogeochemical fluxes of carbon, nutrients and dissolved minerals from the land surface to the Arctic Ocean. New data products include polar scatterometer data and a detailed GIS inventory of the physical properties of ~10,000 peatlands (freely available from the National Snow and Ice Data Center).

(PI) NASA LAND SURFACE HYDROLOGY PROGRAM (9/01/98-9/01/01) **\$343,914**
"Real-time forecasting and rapid post-event assessment of erosional and depositional flood damage" (L. Smith, L. Mertes, B. Gomez, F. Magilligan) This three-year study used field campaigns, airborne laser altimetry and SAR interferometry to quantify 3-D volumes of sediment erosion and deposition resulting from a catastrophic 1996 glacial outburst floods in Iceland.

(PI) NATIONAL SCIENCE FOUNDATION, OFFICE OF POLAR PROGRAMS (8/01/97-7/31/99) **\$176,162**
"Temporal Remote Sensing of Seasonal Inundation and Ice Breakup on Arctic Russian Rivers: Controls on Water, Sediment, and Nutrient Delivery to the Arctic Ocean"
(L. Smith) This two-year study used remotely sensed imagery to determine ranges of natural hydrologic variability in rivers and near-shore environments of Arctic Russia.

(PI) NASA OFFICE OF EARTH SCIENCE (\$193,000) and UCLA IoE/OID (\$51,000) **\$244,000**
"A Campus-Wide Initiative for Interdisciplinary Study of the Environment with Remote Sensing" (10/1/97) (L. Smith) This one-time equipment grant was awarded to create the Environmental Remote Sensing Research Laboratory at UCLA. The facility now aids faculty and graduate research emphasize image-processing and GIS analysis of satellite imagery for environmental study of the Earth.

(PI) CALIFORNIA SPACE INSTITUTE (7/1/97-6/30/99). **\$23,919**
"Study of Mackenzie River Delta Inundation Patterns with Interferometric Synthetic Aperture Radar" (L. Smith) This pilot study explored the use of SAR interferometry, particularly phase decorrelation, to

study trends in the seasonal inundation on the Mackenzie River Delta.

FUNDED PROPOSALS WITH SMITH AS CO-INVESTIGATOR (TOTAL: \$3,546,736)

(Co-I) NASA Terrestrial Hydrology Program (UCLA portion) (12/24/2014-12/6/2017) **\$96,990**
Airborne imaging of water level and inundation extent in high-latitude hydrologic systems to address SWOT mission science and validation goals (Grant 5100754, PI Tamlin Pavelsky, UNC-Chapel Hill)
This three-year project validated AirSWOT water surface elevations, widths, and slopes over the Tanana River and Yukon River, Alaska (.5 mo./yr)

(Co-I) U.S. Department of Interior/ U.S. Geological Survey (10/5/2012-10/4/2017) **\$973,328**
“Developing decadal high-resolution global lake products from Landsat archival data and future missions” (grant G12PC00071, PI Y. Sheng, Co-I L. Smith) This 5-year project developed a global GIS database of lake locations and shorelines using archived and ongoing Landsat Thematic Mapper imagery (0.5 mo./yr)

(Co-I) NASA PHYSICAL OCEANOGRAPHY PROGRAM (2010-2013) **\$402,951**
Assessing and retiring risk in SWOT discharge products: Two methods for characterizing river depth (PI M. Durand, Co-I’s Smith, Andreadis; UCLA portion \$132,599) This three-year study assessed the danger of river depth uncertainty for confounding discharge retrievals from the proposed SWOT satellite mission concept (1 mo./yr)

(Co-I) NASA TERRESTRIAL HYDROLOGY PROGRAM (2007 – 2010) **\$458,599**
“Growing or Going? A Pan-Arctic Assessment of Recent Terrestrial Water Storage Change in High-Latitude Lakes and Wetlands,” [grant NNX08AE51G] (PI Y. Sheng, Co-I L. Smith) This three-year study developed a northern hemisphere database on lake distribution using archived satellite data (1 mo./yr)

(Co-I) NSF ARCTIC SYSTEM SCIENCES PROGRAM (2007 – 2010) **\$242,684**
Collaborative Research: Changes in Lake Dynamics on the Arctic Coastal Plain of North America Over the Past Half-Century [ARC-0713903] (PI Y. Sheng, Co-I L. Smith) This three-year study used field work and remote sensing to examine thaw-lake evolution around Barrow, Alaska. (0.75 mo/yr)

(Co-I) NASA LAND SURFACE HYDROLOGY PROGRAM (01/03 – 12/04) **\$91,707**
“NASA Working Group on Hydrologic Processes of Rivers and Wetlands” (P.I. D. Alsdorf, UCLA)
Administrative funding for the working group formerly known as HYDRA-SAT, which is exploring technologies and science drivers for a possible space-based mission dedicated to the study of surface water.

(Co-I) NASA SOLID EARTH/NATURAL HAZARDS PROGRAM (9/09/00-9/01/03) **\$370,254**
“Globally Consistent Topographic Characterization of Large River Floodplains Based on the SRTM DEM” (P.I. Leal Mertes, University of California, Santa Barbara) This project built accurate fine-scale watershed models of 50 reference sites from 24 of the world’s major rivers, to investigate flood hazards and their inundation potential.

(Co-I) INTEL CORPORATION (9/01/98-9/01/01) **\$703,485**
“Proposal to Establish and Intel-based Regional Environmental Assessment Laboratory and Regional Environmental Geographic Information System (REAL/GIS)” (P.I. Richard Turco, Atmospheric Sciences, UCLA) This project provided advanced Intel workstations and networking hardware for computational research facilities housed in the UCLA Math Sciences and Geography Departments, as well as a new computer teaching facility in Geography.

(Co-I) NASA POLAR PROGRAMS (1/1/98-12/31/00). **\$206,738**
“The Spatial and Temporal Characteristics of High Latitude Seasonal Snow Melt as Detected by Passive and Active Microwave Sensors” (P.I. Richard Forster, Department of Geography, University of Utah) This three-year study explored the use of SAR scatterometry and passive microwave radiometry to establish seasonal and temporal patterns in the timing of thaw onset in the Arctic.

Earth's Physical Environment (Geog 1): This General Education course provides a fundamental understanding of the Earth's atmosphere, energy balance, oceanic circulation, hydrology, weather, internal structure, geomorphology, natural hazards and ecology in an introductory synthesis emphasizing a systems approach to geoscience. Hands-on experience is also provided through weekly laboratory exercises.

People and Earth's Ecosystems (Geog 5): This popular General Education course provides an introduction to the Earth's physical and biological systems and their interface with human society. A systems approach is used to present climate change, tropical deforestation, biodiversity loss, environmental pollution, genetic engineering of foods, and other issues facing human society through a balanced format presenting both sides of controversial environmental issues. Additional exercises and group debates are provided in weekly laboratories.

Biophysical and Social Transformations in Northern Regions (Geog 119):

This senior-level class examines ongoing transformation of the world's northern high latitudes due to key 21st century trends of climate change, natural resource development, economic globalization, and population demographics. Eight northern countries (including U.S.) face array of challenges and opportunities ranging from species extinctions to increased viability of shipping lanes. The course blends principles of human and biophysical geography to gain new understanding of northern quarter of planet and its broader importance to the world.

Glacier Environments of California's High Sierra (Geog 162): This summer field course takes place in the highly glaciated eastern Sierras, where students carry out individual research projects and learn basic mechanics of glacial flow, sediment transport, and geomorphology. Student research projects to date include mass balance studies of the Conness Glacier, snowline fluctuations, interpretation of Quaternary glacial advances from moraine mapping, aquatic geochemistry, invertebrate diversity, temperature lapse rates, and human impacts on a pristine wilderness area.

Introduction to Geographic Information Systems (Geog 168): This upper-level course introduces students to the fast-growing discipline of Geographic Information Systems, an information technology that is irrevocably changing the way we store, query, and analyze spatial data. Lectures are technical in nature and designed to provide students with an understanding of how data are created, stored and manipulated. Laboratory exercises and an independent project provide hands-on exposure to GIS software.

Introduction to satellite remote sensing and Imaging GIS (Geog 169): This upper-level course introduces concepts of remote sensing and raster GIS manipulation of satellite-derived images of the Earth's surface. Past, current and planned sensors operating in the visible, infrared, and microwave range of the electromagnetic spectrum are introduced. Global Positioning System (GPS), topographic imaging, and radar technologies are also discussed. Physical concepts and applications to land surface change, environmental monitoring, oceanography, and meteorology are stressed. Digital image processing methods are also provided in lecture and through weekly computer-based laboratory exercises.

Graduate courses and seminars include **Advanced Projects in Geographic Information Systems, Physical Environment of the Arctic, Satellite Synthetic Aperture Radar Remote Sensing and Interferometry; Geomorphology of Mars and other Planets, Advanced Regions, and Emerging Controversies in Earth System Science.**

GRADUATE STUDENTS SUPERVISED AT UCLA

Cynthia Hall-Atkinson (M.A., now at JPL), Karen E. Frey (M.A., Ph.D., now Associate Professor, Clark University Department of Geography), Tamlin M. Pavelsky (M.A., Ph.D., now Associate Professor, UNC-Chapel Hill Department Geological Sciences), Gina Hendricks (M.A.), Scott R. Stephenson (M.A. 2010, PhD 2014, now Assistant Professor, UConn Department of Geography), Matthew K. Mersel (M.A., 2012, now at CRREL, U.S. Army Cold Regions and Research Laboratory), Vena W. Chu (M.A. 2009, PhD 2015, now Assistant Professor, UC Santa Barbara Department of Geography), Colin J. Gleason (Ph.D. 2016, now Assistant Professor, UMass Amherst Department of Civil and Environmental Engineering); Kang Yang

(visiting Ph.D. student, 2012-13; now Associate Professor, Nanjing University), Lincoln Pitcher (M.A. 2015, now earning Ph.D.), Mia Bennett (Ph.D. 2017, now Assistant Professor, Hong Kong University), Matthew G. Cooper (now earning Ph.D.), Sarah W. Cooley (now earning Ph.D.), Jessica Fayne (now earning Ph.D.)

POST-DOCTORAL SCIENTISTS SUPERVISED AT UCLA

Dr. Yongwei Sheng (Ph.D., UC Berkeley, now Associate Professor, UCLA Department of Geography)
Dr. Asa Rennermalm (Ph.D., Princeton, now Assistant Professor, University of Rutgers, Department of Geography), Dr. Kang Yang (now Associate Professor, Nanjing University), Dr. Jonathan C. Ryan (now postdoctoral scholar, Brown University)

INDEPENDENT UNDERGRADUATE RESEARCH SUPERVISED AT UCLA (since 2006)

Estey Theriault (2006), Kevin Sampson, Sarah Lewis (2005), Richard Carlos (2007), John Freedman, Nora Hakkakzadeh (2008), Kaitlin Kelley-Reif, Reni Pernova, Ryan Chen, Alana Ayasse, Laura McNerney, Jinny Lee (2013), Robert Abraham (2014), Oliwia Baney (2014), Maya Bruguera (2014), Yingying Xiao (2015), Kelly Young (2015), Yuxi Suo (2015), Lin Lu (2016), Ariana Nickmeyer (2016), Claire Simpson (2016-17), Wing Yi Yeung (2016-17), Zhaoxin Ban (2016-17), Sarah Popelka (2017-18)

MY OWN GRADUATE ADVISORS

M.S. (Indiana University): Gregory A. Olyphant, Gordon S. Fraser, Lawrence J. Onesti

Ph.D. (Cornell University): Bryan L. Isacks, Arthur L. Bloom., Wilfried H. Brutsaert, Donald L. Turcotte

PROFESSIONAL ACTIVITIES

Member, *The American Geophysical Union (AGU)*, *The Association of American Geographers (AAG)* and the *International Permafrost Association*. Manuscript reviewer for *Arctic and Alpine Research*, *Catena*, *J. Climate*, *Environmental Geology*, *Eos*, *J. Geophysical Research*, *Geophysical Research Letters*, *J. Glaciology*, *Global and Biogeochemical Cycles*, *Hydrological Processes*, *J. Hydrometeorology*, *IEEE Trans. Geoscience and Remote Sensing*, *Intl. J. Remote Sensing*, *Intl. Assoc. Hydrological Sciences (IAHS)*, *Nature*, *Permafrost and Periglacial Processes*, *Photogrammetric Engineering and Remote Sensing*, *Physical Geography*, *Proceedings of the National Academy of Sciences (PNAS)*, *Quaternary International*, *Remote Sensing of Environment*, and *Water Resources Research*, as well as the *IPCC Assessment Report on Climate Change*, and proposals to NERC, NASA and the National Science Foundation.

NASA Science Team, SWOT Surface Water and Ocean Topography Mission, (2016-present)

Guest Editor, Proceedings National Academy of Sciences (PNAS) (2016)

External Reviewer, Department of Geography, UC Santa Barbara (Feb 3-4, 2016)

NASA Mission Concept Review panelist, SWOT Surface Water and Ocean Topography Mission (2012)

Proposal review panel, NASA Cryospheric Sciences Program (2012)

Associate Editor, *Annals of the Association of American Geographers*, 2010 - 2016

External Reviewer, Dartmouth College Department of Geography, 14-16 March 2010.

Board of Directors, AAG Cryosphere Specialty Group, 2008 – 2010.

JPL Visiting Committee (external review committee), 2007

Capitol Hill briefing, Thawing of Arctic Permafrost: Extent, Causation and Implications, Russell Senate Building, Washington D.C. (February 21, 2006)

NASA Earth Science Senior Review, Washington D.C. (April 26-29, 2005)

Special Session Organizer for annual meetings of the AGU (2002, 2004) and AAG (2005, 2007)

(2004 – 2006) Co-chair, Hydrology Section Remote Sensing Technical Committee, American Geophysical Union

(January 2004 - 2007) Invited member, Science Advisory Committee, World Climate Research Program, United States CLiC (Climate and the Cryosphere program)

(2003-2007) member, Hydrology Section Remote Sensing Technical Committee, American Geophysical Union

(2003 – 2006) Co-director, NASA Working Group on Hydrologic Processes of Rivers and Wetlands (formerly HYDRA-SAT Working Group)

(2002 – 2004) UCLA representative to the CUAHSI (Consortium of Universities for the Advancement of Hydrologic Science) Board of Directors.

(2000 – 2003) member, HYDRA-SAT / NASA Working Group on Hydrologic Processes of Rivers and Wetlands

(1998- 2004) Review Committee Ta Liang Memorial Award, granted annually by the *American Society for Photogrammetry and Remote Sensing*

(2001- 2003) Invited Member, Alaska SAR Facility User's Working Group, Fairbanks, Alaska

(2000- 2003) Invited Member, Steering Committee for the National Science Foundation *Russian-American Initiative on Shelf-Land Environments in the Arctic (RAISE)*, Arctic System Science program, Office of Polar Programs.

(2001) Organizing Committee, *WSPCC 2001, International Field Symposium and Excursion: West Siberian Peatlands and Carbon Cycle--Past and Present*, 18-22 August 2001, Noyabrsk, Russia.

(2001) Organizer, Special Session H18, Remote Observation of Rivers and Wetlands, Fall Meeting, American Geophysical Union, 10-14 December 2001, San Francisco.

(2001) Science Instrument Panel, NASA '07 Mars Reconnaissance Orbiter

COLLABORATORS

Douglas Alsdorf (*Ohio State University*), Rick Forster (*University of Utah*), Yongwei Sheng (*UCLA*), Dorothy Hall (*NASA/Goddard Space Flight Center*), Niels Reeh (*OERSTED, Denmark*), Glen MacDonald (*UCLA*), Frank Magilligan (*Dartmouth*), Andrei Velichko (*Russian Academy of Sciences*), Yongwei Sheng (*UCLA*), Aleksey Sidorchuk (*Moscow State University*), Richard Lammers (*University of New Hampshire*), Alexander Shiklomanov (*University of New Hampshire*), Jason Box (*The Ohio State University*), Asa Rennermalm (*Rutgers University*); Carl Legleiter (*University of Wyoming*); Marco Tedesco (*City College of New York*), Alberto Behar (*NASA JPL*), Michael Durand (*The Ohio State University*), Kostas Andreadis (*NASA JPL*), Ernesto Rodriguez (*NASA JPL*).

OUTREACH ACTIVITIES

Invited or sponsored lectures: *Caltech* (Division of Geological and Planetary Sciences), *Stanford University* (Department of Geological and Environmental Sciences), *UC Santa Cruz* (Department of Earth Sciences), *University of Nebraska* (Department of Geosciences); *UCLA* (Department of Earth and Space Sciences, 10/13/05), *UCLA* (Department of Civil and Environmental Engineering 2/14/06), *Caltech* (Division of Engineering and Applied Science), *University of Nebraska* (Department of Geosciences), *University of California, Santa Barbara* (Department of Geography, 2/26/04), *University of California, Irvine* (Earth Systems Science), *The Ohio State University* (School of Earth Sciences and Dept. Geography, 11/17/05), *Colorado University* (Department of Geography, 4/7/06), *Lamont-Doherty Earth Observatory* (11/06), *UC Berkeley* (Department of Geography, 11/15/06), *NASA Goddard Institute for Space Studies*

(GISS, 10/11/06), *University of South Carolina* (Dept. Geological Sciences, 4/12/07), *Lamont-Doherty Earth Observatory* (LDEO, 1/19/07), *UCLA IGPP* (10/16/07), *CGU/CMOS* (Keynote, 2010); *Texas A&M University* (Dept. Geography, 10/8/2010), *University of Kansas* (C-CHANGE Colloquium Series, 10/11/2010), *UCLA* (Dept. Geography, 10/15/2010), *Port 2050* (Vancouver, 10/27/10), *University of Arizona*, (Dept. Geography, 11/5/10), *UC Irvine open public lecture* (Irvine, 11/17/10), *California Capitol Summit* (Los Angeles, 11/19/10), *Skeptics Society Distinguished Lecture Series* (Caltech, Pasadena, 11/21/10), *Physicians for Social Responsibility-Los Angeles* (Global Security Seminar, Los Angeles, 12/7/10), *Northern Alberta Development Council* (Grande Prairie, 1/21/10), *University of Washington* (Dept. Civil and Environmental Engineering (1/27/11); *UCLA Friends of Geography* (3/6/2011); *UCLA School of Law* (Faculty Monday Colloquium, 3/7/11); *The Royal Society of Arts, Manufactures and Commerce* (RSA) (London, 3/23/11); *UNC-Chapel Hill* (Dept. Geological Sciences, 4/1/2011); *Pasadena Senior's Center* (4/21/2011); *UC Office of the President* (UCOP, 4/29/2011); *Los Angeles Times Festival of Books* (4/30/2011); *Amerika Haus München* (Munich, 6/14/2011); *Deutsch-Amerikanisches Institut* (Heidelberg, 6/15/2011); *Deutsch-Amerikanisches Zentrum* (Stuttgart, 6/16/2011); *Goethe-Universität/US-Generalkonsulat* (Frankfurt, 6/17/11); *Long Beach Aquarium of the Pacific* (6/23/11); *RAND Corporation* (Santa Monica, 6/29/11); *American Planning Association* (Nashville, 9/29/11); *Foundation for the Future* (Seattle, 10/27/11); *UCLA Marschak Colloquium* (Los Angeles, 10/28/11); *World Economic Forum* (Davos, 1/27/12); *Arctic Business Forum* (Rovaniemi, Finland 2/21/12); *DHL* (Cologne, Germany 3/14/2012), *Shell* (Houston, 3/28/12), *AAAS John Wesley Powell Memorial Lecture* (Tulsa, 4/1/2012), *University of Alaska Anchorage* (4/12/2012); *National Academy of Sciences Distinctive Voices series* (Irvine, CA 9/5/2012); *University of Michigan* (Dept. Geological Sciences, 9/21/2012), *International Women's Forum* (San Francisco, 10/26/2012); *Western Transportation Advisory Council* (Vancouver, 11/21/2012); *ION Geo* (New Orleans, 11/27/2012); *Finnish Meteorological Institute* (Helsinki, 1/15/2013); *Santa Monica College Global Connections lecture series* (Los Angeles, 3/5/2013); *Federation of Icelandic Industries* (Reykjavík, 3/14/13); *University of Nordland* (Bodø, Norway 3/20/13); *The Ohio State University Robinson Lecture* (Columbus, 4/5/2013); *Luleå University of Technology* (Luleå, Sweden, 9/11/2013); *Nordic Energy Research* (Stockholm, Sweden, 9/12/2013); *Loomis Chaffee School Hubbard Speaker Series* (Windsor, CT, 9/24/2013) *Simpson College McBride Lecture* (Indianola, IA, 10/2/2013), *California Science Teachers Association* (Palm Springs, 10/27/2013); *Saginaw Valley State University Dow Visiting Scholar Lecture* (Saginaw, MI, 11/5/2013); *World Economic Forum* (Davos, 1/23/14); *Energy Policy Foundation of Norway* (Oslo, Norway 2/14/2014); *University of Nordland* (Norway, 3/19/14); *Friends Central Science Lecture Series* (Philadelphia, PA, 4/9/2014); *Arctic Business Council keynote* (Norway, 10/9/14); *Duke University* (The Nicholas School, 10/16/14), *Arctic Circle Plenary Speaker* (Reykjavik, 10/31/2014), *MTU America keynote* (Miami, 1/29/2015); *University of Georgia* (Department of Geography, 1/30/15), *Arctic Economic Council* (Ottawa, 4/23/15); *World Economic Forum* (Davos, 1/21/16), *Brown University* (Department Earth, Environmental, and Planetary Sciences 1/28/16); *Yukon Land Use Planning keynote* (Whitehorse, Yukon Territory, 2/16/16), *Castilleja School keynote* (Palo Alto, CA, 4/5/2016); *University of Delaware Mather Lecture* (Department of Geography, 10/3/16), *University of Illinois* (Urbana-Champaign, 10/4/16); *University of Alberta Sustainability Speaker Series*, (Edmonton 11/22/2016); *University of Northern British Columbia* (Prince George, 2/2/17), *Stanford University Geophysics Department Seminar* (5/4/2018); *World Forum for Foreign Direct Investment*, Shanghai (5/24/17); *Safety Codes Council Annual Conference*, Banff Alberta (6/1/17); *Charity Dinner for the Toronto General Hospital* (Toronto, 10/28/17); *Canola Council of Canada Annual Convention* (Palm Springs, 3/07/18); *Barry Commoner Lecture*, Marymount Manhattan College (New York City, 3/13/18); *Grain Farmers of Ontario 2018 March Classic*, (London, 3/20/18); *Texas A&M University-Texarkana* (Program for Learning and Community Engagement, 4/3/18); *Korea Carbon Forum 2018* (Pyongyang, South Korea, 10/11/18); *Husky Energy Annual Fall Meeting* (Calgary, 10/16/18)

BOOK REVIEWS OF "THE WORLD IN 2050" / "THE NEW NORTH"

MOTHER JONES "Books: Fall Reading List" (September/October issue 2010)

<http://motherjones.com/media/2010/09/book-reviews>

CHICAGO SUN-TIMES "Fall Preview: Books" (book picks) (Sept. 12, 2010)

<http://www.suntimes.com/entertainment/books/2695388.fall-preview-books-091210.article>

THE GLOBE AND MAIL "10 books you have to read this fall" (Sept 17, 2010)
<http://www.theglobeandmail.com/books/10-books-you-have-to-read-this-fall/article1711599/>

NEW SCIENTIST "Triumph of the north or technological salvation?" (by Chris Mooney) (Sept. 22, 2010)
<http://www.newscientist.com/article/mg20727796.500-triumph-of-the-north-or-technological-salvation.html>

WALL STREET JOURNAL "Go North, Young Man" (BOOK REVIEW) (Sept. 25, 2010)
<http://online.wsj.com/article/SB10001424052748703989304575504110335459830.html>

WORLD POLITICS REVIEW "The New Rules: Global warming shifts focus to the Friendly North" (BOOK REVIEW, by Thomas P.M. Barnett, Sept. 27, 2010)
<http://www.worldpoliticsreview.com/articles/6516/the-new-rules-global-warming-shifts-focus-to-the-friendly-north>

NATURE "Books in Brief" (Sept. 29, 2010), Nature 467, p. 527, doi:10.1038/467527a
<http://www.nature.com/nature/journal/v467/n7315/full/467527a.html>

CBC BOOKS "Climate expert Laurence Smith paints an alarming picture of the future in his new book" (Oct 5, 2010) <http://www.cbc.ca/books/2010/10/climate-expert-laurence-smith-paints-an-alarming-picture-of-the-future-in-his-new-book.html>

NUTASIAQ ONLINE "Nunavut in 2050 may look like Nevada" (BOOK REVIEW, Oct. 19, 2010)
http://www.nunatsiaqonline.ca/stories/article/19887_nunavut_in_2050_may_look_like_nevada/

SEED MAGAZINE "The New North" (BOOK REVIEW by Fred Pearce, Oct. 22, 2010)
http://seedmagazine.com/content/article/the_new_north/

ONEARTH MAGAZINE "Winners and Losers" (BOOK REVIEW by Tim Folger, Nov. 24, 2010)
<http://www.onearth.org/article/winners-and-losers>

SEATTLE TIMES "'The World in 2050': What countries of the north will look like 40 years hence" (Nov. 27, 2010) (BOOK REVIEW, by Curt Schleier)
http://seattletimes.nwsourc.com/html/books/2013516463_br28world.html?prmid=head_more

BIGTHINK.COM "Adapt to What? Laurence Smith's World in 2050" (Dec. 4, 2010) (BOOK REVIEW, by Parag and Ayesha Khanna) <http://bigthink.com/ideas/25268>

LIBRARY JOURNAL "Science and Technology Reviews" (BOOK REVIEW by Robin Dillow, Dec. 15, 2010)
http://www.libraryjournal.com/lj/ljinprintcurrentissue/887672403/science_technology_reviews_december.html.csp

LIBRARY JOURNAL "Best Sci-Tech Books 2010" (by Gregg Sapp, Dec. 16, 2010)
http://www.libraryjournal.com/lj/collectiondevelopmentbestbooks/888365-476/lj_best_sci-tech_books_2010.html.csp

FRUMFORUM.COM "Our Favorite Books of 2010" (by Kenneth Silber, Dec. 24, 2010)
<http://www.frumforum.com/our-favorite-books-of-2010>

EDMONTON JOURNAL "Review: The Silver Lining of Climate Change" (BOOK REVIEW by Richard Sherbaniuk, Jan. 2, 2011)
<http://www.edmontonjournal.com/business/Review+silver+lining+climate+change/4049557/story.html>

THE HIPPO (New Hampshire's largest weekly) "Future Reads: The View from 20 and 40 years out" (Jan 20-16, 2011) <http://www.hippopress.com/read-article/future-reads->

THE FUTURIST Magazine "Human Civilization Migrates Northward" (Jan/Feb issue, 2011) (BOOK REVIEW, by Rick Docksai) <http://www.wfs.org/content/human-civilization-migrates-northward>

THE ECONOMIST "The de-icing age: Tomorrow at the top of the world" [BOOK REVIEW] (Feb. 3, 2011) http://www.economist.com/node/18060790?story_id=18060790&fsrc=rss

THE GLOBE AND MAIL (Toronto) "Laurier was wrong. It's the 21st century that's ours" (Feb. 21, 2011) [BOOK REVIEW, by Simon Dalby] <http://www.theglobeandmail.com/news/arts/books/the-world-in-2050-by-laurence-c-smith/article1915186/>

LONDON EVENING STANDARD "The New North describes a not too distant future" (March 17, 2011) (BOOK REVIEW, by Andrew Neather) <http://www.thisislondon.co.uk/lifestyle/book/article-23932982-the-new-north-describes-a-not-to-distant-future.do>

ROYAL GEOGRAPHICAL SOCIETY "Book of the month: The rising of the North" (BOOK REVIEW, by Jonathan Wright, *Geographical Reviews*, March 2011)

NEW STATESMAN "The New North: the World in 2050" (March 31, 2011) [BOOK REVIEW, by John Gray] <http://www.newstatesman.com/books/2011/03/natural-resources-world-global>

THE ECOLOGIST "The New North: The World in 2050 by Laurence Smith" (March 31, 2011) [BOOK REVIEW, by Jeff Holman] http://www.theecologist.org/reviews/books/825963/the_new_north_the_world_in_2050_by_laurence_smist_h.html

TIMES HIGHER EDUCATION "The New North: The World in 2050" [BOOK REVIEW, by Steve Yearley] (April 13, 2011) <http://www.timeshighereducation.co.uk/story.asp?sectioncode=26&storycode=415787&c=1>

FINANCIAL TIMES "The New North" [BOOK REVIEW, by Crispin Tickell] (April 22, 2011) <http://www.ft.com/cms/s/2/77dd0b4e-6b9f-11e0-93f8-00144feab49a.html?ftcamp=rss#axzz1Ka5l4XCy>

JOURNAL OF REGIONAL SCIENCE "The World in 2050: Four Forces Shaping Civilization's Northern Future" (BOOK REVIEW, by Timothy Heleniak) JOURNAL OF REGIONAL SCIENCE, VOL. 51, NO. 4, 2011. http://onlinelibrary.wiley.com/doi/10.1111/j.1467-9787.2011.00740_11.x/abstract

Schwab, James C. (2011) "Review of The World in 2050: Four Forces Shaping Civilization's Northern Future," *Journal of Homeland Security and Emergency Management*: Vol. 8: Iss. 1, Article 18. DOI: 10.2202/1547-7355.1844
Available at: <http://www.bepress.com/jhsem/vol8/iss1/18>

SURVIVAL: GLOBAL POLITICS AND STRATEGY BOOK REVIEWS "The New North: The World in 2050" by Ray Takeyh, H. R. McMaster & Gilles Andréani (2012): Book Reviews, *Survival: Global Politics and Strategy*, 54:2, 179-198 <http://dx.doi.org/10.1080/00396338.2012.672809>

RADIO INTERVIEWS (PARTIAL LIST)

NPR All Things Considered "Signs of global warming in Arctic Siberia" (June 2, 2005) <http://www.npr.org/templates/story/story.php?storyId=4677789>

WNYC Radio (9/4/2010); The Toronto Star (9/1/10), CBC Radio (9/17/10), QR77 Radio Calgary (9/17/10), *Dangerous Minds* (9/19/10), National Post (9/20/10), CNN International (9/22/10), Russia TV (9/23/10), national radio tour (~30 stations, 9/28/10), Business Talk Radio (9/28/10), *La Presse* (9/29/10), Bill Kelly Show (9/29/10), *Quirks & Quarks* (9/29/10), the Tommy Schnurmacher Show (9/29/10), *UCLA Magazine* (9/30/10), BNN national TV (10/1/10), CBS News Osgood File (10/4/10), WJON Radio

(10/6/10), Forthright Radio (10/6/10), Point of Inquiry (10/13/10), Connie Martinson Talks Books (10/13/10), CBC Nunavut (10/14/10), Coast to Coast national radio (10/16/10), the Patt Morrison Show (10/2/10), Jefferson Public Radio (10/15/10), L'Actualite (10/15/10), TVO The Agenda with Steve Paikin (10/16/10), CT Public Radio (10/19/10), Los Angeles Times (10/22/10), Radio One Network (10/23/10), Pat Williams Show (12/2/10), Climate Central (12/14/10), Canadian Business & MoneySense (2/2/11), Financial Sense News Hour (2/23/10)

National Public Radio Talk of the Nation "Preparing for the World of 2030 (12/20/12)
<http://www.npr.org/2012/12/20/167720688/preparing-for-the-world-of-2030>

CBC News Radio "North Pole shipping route could open by midcentury" (March 6, 2013)
<http://www.cbc.ca/news/technology/story/2013/03/06/science-northern-shipping-routes.html>

Scholar's Circle;

KPCC-89.3 "Take Two" about NRC report and abrupt climate change (December 4, 2013)
<http://mediacenter.tveyes.com/downloadgateway.aspx?UserID=176482&MDID=2600512&MSeed=9974&Type=Media>

OTHER MEDIA COVERAGE (PARTIAL LIST) *print media*

Also featured on ABC Nightly News with Peter Jennings, The Discover Channel, and The History Channel.

Science Daily "Study pinpointing origins of Siberian peat bogs raises concerns" (Jan. 16, 2004)

Los Angeles Times "Russian bogs hold more methane than expected" (Jan. 17, 2004)

Christian Science Monitor "Global warming has gone to the bogs" (March 11, 2004)

National Geographic "Support for saving peatlands is squishy but solidifying" (Nov. 5, 2004)

National Geographic "Melting Arctic Bogs may Hasten Warming, Study Says" (Dec. 1, 2004)

National Public Radio "Signs of global warming in Arctic Siberia" (All Things Considered June 2, 2005)

Los Angeles Times "Arctic warming is drying up lakes, study finds" (June 3, 2005)

Boston Globe "Siberian lakes are shrinking" Boston Globe (June 7, 2005)

San Francisco Chronicle "Siberia's Arctic lakes drying up -- permafrost apparently melting" (June 3, 2005)

Guardian Unlimited "Shrinking lakes of Siberia blamed on global warming" (June 10, 2005)

Christian Science Monitor "Siberia's shrinking lakes" (June 2, 2005)

Washington Post "Siberian Lakes Disappearing" (June 6, 2005)

Environment News Service "Arctic lakes vanishing as planet warms" (June 6, 2005)

Anchorage Daily News "Melting permafrost may shrink lakes" (June 7, 2005)

New Scientist "Climate warning as Siberia melts" (Aug. 11, 2005)

Guardian Unlimited "Warming hits 'tipping point'" (Aug.19,2005)

Time Magazine "Global Warming: The Culprit?" (Oct. 3, 2005)

Anchorage Daily News "North's change is mapped out at conference" (Dec 18, 2005)

Discover Magazine "The Year in Science" (January, 2006)

United Press International "Bogs may have started past global warming" (Oct 18, 2006)

Audubon "As the world dries" July 1, 2006

University Wire "UCLA Professor travels to the Arctic to study global warming" (Aug. 21, 2006)

Radio Free Europe "Russia: Siberia's once-frozen tundra is melting" (Oct. 12, 2006)

UPI News Track "Bogs may have started past global warming" (Jan. 1, 2007)

Montreal Gazette "Arctic Quest: Seabed to Sky" (Sept. 15, 2007)

Montreal Gazette "Water - fresh and salt, liquid and solid" (Sept. 19, 2007)

Times Online " Science has second thoughts about life" (Jan. 1, 2008)

Der Spiegel "A Storehouse of greenhouse gases is opening in Siberia" (Apr. 17, 2008)

New Scientist "Top scientists predict the future of science" (June 9, 2009)

La Repubblica (Italy) "Il mondo che verrà" by Gabriella Colarusso (Oct. 31, 2009)

WIRED Magazine (Italy) "Risposte sul futuro" WIRED Magazine (Italy edition), December 2009

New Scientist "Methane bubbling out of Arctic Ocean - but is it new?" (March 4, 2010)

Science Daily "Global Warming's Silver Lining? Northern Countries Will Thrive and Grow, Researcher Predicts (Sep. 5, 2010)

Daily Mail "Global warming to boost economic power of cities in the 'New North' which can unlock natural resources" (Sept. 6, 2010)

Barents Observer "Global Warming will create new Arctic power centers" (Sept. 7, 2010)

Toronto Sun "Why Canada is Looking Hot" (Sept. 8, 2010)

Mother Jones Magazine "Mixed Media: Books" (book reviews) September/October 2010 Issue (Sept. 2010)

Chicago Sun-Times "Fall Preview: Books" (book picks) (Sept. 12, 2010)

Vancouver Sun "Climate change could make Canada a major world power: geographer" (Sept. 14, 2010)

Ottawa Citizen "Climate change could make Canada's North an economic hothouse" (Sept 14, 2010) [COVER STORY]

Montreal Gazette "The North to Boom, author contends" (Sept 15, 2010)

The Globe and Mail "10 books you have to read this fall" (Sept 17, 2010)

The Wall Street Journal "Unfreezing Arctic Assets" [COVER STORY & EXCERPT] (Sept. 18-19 2010)

DAILY BRUIN "Professor's book models future of the Arctic" (Sept. 23, 2010)

NATIONAL POST "Hotter globe gives Canada boost in 2050", (Sept. 25, 2010)

OTTAWA CITIZEN "United Fronts" (Sept 25, 2010)

CTVNews "Could global warming turn Canada into a superpower?" (Sept. 25, 2010) (By Andy Johnson)

TORONTO STAR "A Scary, new climate-changed world" (Oct. 8, 2010)

LA PRESSE "Le monde en 2050 selon Laurence C. Smith" (Oct 9, 2010)

SEE MAGAZINE "Stuff to do with your time" (Oct. 14, 2010)

THE WHY FILES "The State of the Rivers: Ruinous?" (Oct. 14, 2010)

RENO NEWS AND REVIEW "Vote early and move past the election" (Oct. 21, 2010)

MACLEANS "Nordic style obsession" (Oct. 27, 2010)

CANADA.COM "Canada and the World in 2050" (by R. Grigg, Nov. 12, 2010)

LOS ANGELES TIMES "The World in 2050: The Arctic and everything below" (Nov. 24, 2010)

SMITHSONIAN.COM "Nine science books I wish I'd had time to read this year" (Nov. 30, 2010)

REUTERS "The Good and Bad of 2011" (By Gregg Easterbrook, Dec. 15, 2010)

THE GLOBE AND MAIL "Lament for a TV nation" (by J. Doyle, April 27, 2011)

THE WEEKLY STANDARD (Canada) "Arts in the Afternoon: Special Canadian Edition" (by K. Torrance, April 27, 2011)

NATURE.COM "Global warming will open Arctic sea routes but sever the region's ice roads" (by Sid Perkins, May 29, 2011)
http://blogs.nature.com/news/2011/05/global_warming_will_open_arctic.html

TORONTO GLOBE AND MAIL "Global warming jeopardizing ice highways, study says" (by Nathan Vanderklippe, May 29, 2011)
<http://www.theglobeandmail.com/news/national/arctic-shipping-routes-will-open-but-ice-highways-in-jeopardy-study/article2038904/>

THE VANCOUVER SUN "Climate Change will reduce access to northern roadways, study says" (by Margaret Munro, May 30, 2011)
<http://www.vancouver.sun.com/business/Climate+change+will+reduce+access+northern+roadways+study+says/4861026/story.html>

WALL STREET JOURNAL MARKET WATCH "Melting ice has its downside for Canada" (by Bill Mann, May 31, 2011)
http://www.marketwatch.com/story/melting-ice-has-its-downside-for-canada-2011-05-31?link=MW_latest_news

REUTERS "Ice melt to close off Arctic's interior riches: study" (by Timothy Gardner, May 30, 2011)
<http://www.reuters.com/article/2011/05/31/us-arctic-warming-roads-idUSTRE74S1UF20110531>

AFP "Trucks lose, ships win in warmer Arctic" (May 29, 2011)
<http://www.google.com/hostednews/afp/article/ALeqM5iL7izLyyiJjKxdJenv8Pjh7QdqQ?docId=CNG.a7676582db06331f64662f04b50008c7.3c1>

CBC NEWS "Climate change to ravage Arctic ice roads" (May 31, 2011)
<http://www.cbc.ca/news/canada/story/2011/05/31/science-climate-change-iceroads.html?ref=rss>

DAGENS NÆRINGSBLAD (NORWAY) (front page, print edition)
“Spår befolkningsboom i Norge” (May 30, 2012)
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