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Improved inland water levels from SAR altimetry using novel empirical and physical retrackers - DTU Orbit (08/11/2017)

Improved inland water levels from SAR altimetry using novel empirical and physical retrackers

Satellite altimetry has proven a valuable resource of information on river and lake levels where in situ data are sparse or non-existent. In this study several new methods for obtaining stable inland water levels from CryoSat-2 Synthetic Aperture Radar (SAR) altimetry are presented and evaluated. In addition, the possible benefits from combining physical and empirical retrackers are investigated.The retracking methods evaluated in this paper include the physical SAR Altimetry MOde Studies andApplications (SAMOSA3) model, a traditional subwaveform threshold retracker, the proposed MultipleWaveform Persistent Peak (MWaPP) retracker, and a method combining the physical and empiricalretrackers. Using a physical SAR waveform retracker over inland water has not been attempted beforebut shows great promise in this study.The evaluation is performed for two medium-sized lakes (Lake Vänern in Sweden and Lake Okeechobeein Florida), and in the Amazon River in Brazil. Comparing with in situ data shows that using the SAMOSA3retracker generally provides the lowest root-mean-squared-errors (RMSE), closely followed by theMWaPP retracker. For the empirical retrackers, the RMSE values obtained when comparing with in situdata in Lake Vänern and Lake Okeechobee are in the order of 2–5 cm for well-behaved waveforms. Combining the physical and empirical retrackers did not offer significantly improved mean track standarddeviations or RMSEs. Based on these studies, it is suggested that future SAR derived water levels are obtained using the SAMOSA3 retracker whenever information about other physical properties apartfrom range is desired. Otherwise we suggest using the empirical MWaPP retracker described in thispaper, which is both easy to implement, computationally efficient, and gives a height estimate for eventhe most contaminated waveforms.

General information

State: Published
Organisations: National Space Institute, Geodesy, University of Newcastle
Authors: Villadsen, H. (Intern), Deng, X. (Ekstern), Andersen, O. B. (Intern), Stenseng, L. (Intern), Nielsen, K. (Intern), Knudsen, P. (Intern)
Pages: 234-247
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information

Journal: Journal of Hydrology
Volume: 537
ISSN (Print): 0022-1694
Ratings:
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.89 SJR 1.745 SNIP 1.759
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.708 SNIP 1.771 CiteScore 3.54
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.679 SNIP 2.005 CiteScore 3.45
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.71 SNIP 1.997 CiteScore 3.36
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.924 SNIP 2.016 CiteScore 3.38
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.753 SNIP 1.858 CiteScore 3.16
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.784 SNIP 1.714

Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.018 SNIP 1.835
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.922 SNIP 1.758
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.851 SNIP 1.936
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.735 SNIP 2.341
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.602 SNIP 1.887
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.568 SNIP 1.779
Scopus rating (2003): SJR 1.444 SNIP 1.788
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.393 SNIP 1.625
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.493 SNIP 1.381
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 1.076 SNIP 1.324
Scopus rating (1999): SJR 1.318 SNIP 1.376
Original language: English
CryoSat-2, Satellite altimetry, Retracking, SAR, Inland water, SAMOSA
DOIs:
10.1016/j.jhydrol.2016.03.051
Source: FindIt
Source-ID: 2303159259
Publication: Research - peer-review › Journal article – Annual report year: 2016