Improved cloud-screening for AATSR

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Abstract: Identification of clouds in satellite imagery is essential for estimation of surface state variables. Several cloud identification algorithms exist for data from the AATSR sensor on Envisat (e.g. [1], [2]), but none currently identify both clouds and cloud shadows consistently well, especially in the presence of snow or ice. This is an obvious concern in the Canadian context.

To improve cloud identification for AATSR, we are implementing and testing the SPARC algorithm [3] for AATSR data. Potential improvements to SPARC may include use of both the 1.6 and 3.7 µm channels, improved weighting of individual test results, and use of AATSR's dual-view system for cloud height derivation and haze identification. Improved cloud identification also allows AATSR to function as cloud screen for MERIS. Ultimately the work prepares CCRS for the launch of Sentinel-3, which will carry successors for both AATSR and MERIS.

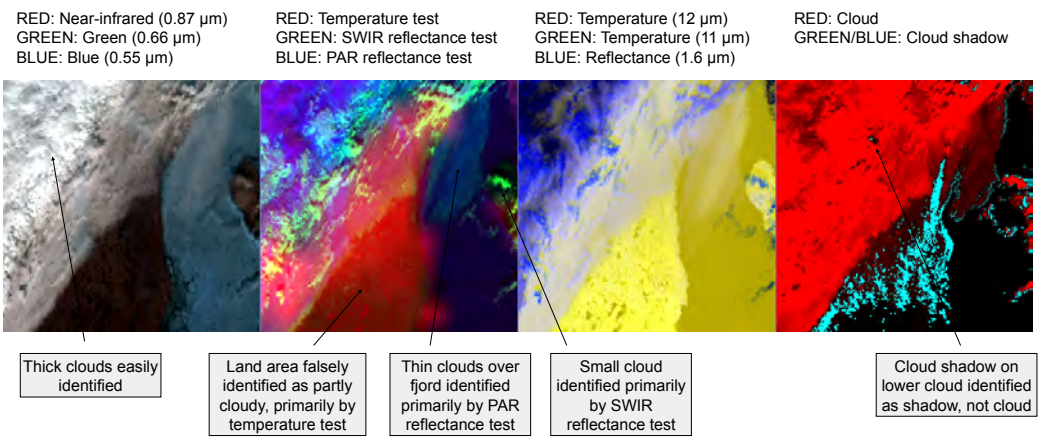
Progress: The SPARC algorithm has been implemented for AATSR data, and initial results look promising. First results are presented below.

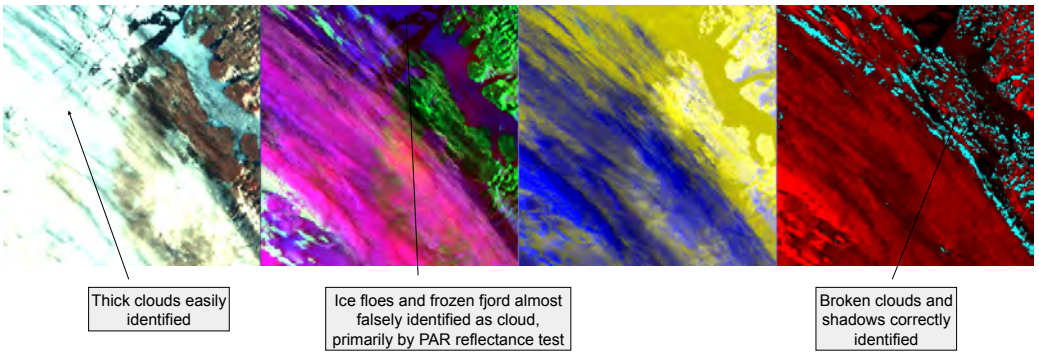
SPARC outline: The SPARC algorithm uses a series of tests, based on the temperature and reflectance of the Earth surface as recorded by the AATSR sensor. Each test produces a score – negative scores indicate likely clear-sky conditions, positive scores indicate likely cloudy conditions. A summation of the test scores, weighted by correction factors, produces a per-pixel aggregated rating of cloud contamination.

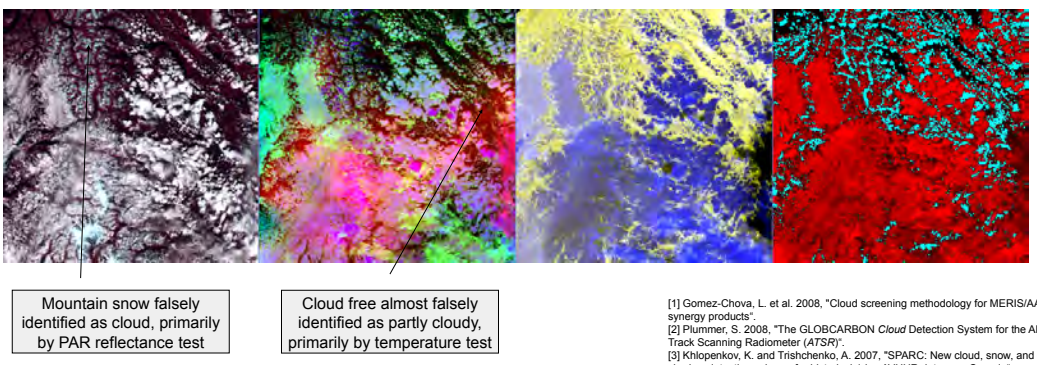
Most other cloud identification algorithms produce a flag identifying pixels as cloudy, partly cloudy or clear. An aggregated rating has two main advantages over a flag approach. First, it provides quantitative information on the confidence / degree of cloud contamination, making selection among several candidates easy for compositing. Second, it allows easy modification of threshold levels for specific uses.

Potential improvements:
- Identification of cloud shadows on lower clouds.
- Tuning of test offset and scale factors.
- Use of AATSR's dual views for improved haze identification.
- Improved ice correction of reflectance tests.
- Improved temperature test in mountains.

Imagery examples, Canada, August 2008:







[1] Gomez-Chova, L. et al. 2008, "Cloud screening methodology for MERIS/AATSR synergy products".
[2] Plummer, S. 2008, "The GLOBCARBON *Cloud* Detection System for the Along-Track Scanning Radiometer (*ATSR*)".
[3] Khlopenkov, K. and Trishchenko, A. 2007, "SPARC: New cloud, snow, and cloud shadow detection scheme for historical 1-km AVHHR data over Canada".