



Arctic circumpolar mosaic at 250m spatial resolution by fusion of MODIS/TERRA land bands B1–B7

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The first spatially enhanced Moderate Resolution Imaging Spectroradiometer (MODIS) clear-sky mosaic for the Arctic circumpolar zone (9000 km x 9000 km) is presented, as a contribution to the Canadian component of the International Polar Year (IPY) Programme. The imagery was obtained by fusion of MODIS bands B1–B2 observed at 250m spatial resolution with bands B3–B7 observed at 500m spatial resolution to satisfy the Global Climate Observing System (GCOS) requirement for a spatial resolution of 250m for satellite-based products for climate. The fusion method used adaptive regression and normalization to preserve the image radiometric properties. A new cloud and cloud shadow detection method and a clear-sky compositing scheme were used for the 250m multispectral data. The product is generated in the Lambert Azimuthal Equal-Area (LAEA) projection centred over the North Pole. The major intended application of the new data is mapping the surface albedo at 250m spatial resolution. This product in turn can be used as an input for generating several other Essential Climate Variables (ECVs) as defined by the GCOS.

The MODIS sensor functioning on the TERRA and AQUA satellites is one of the most advanced Earth observing sensors currently operating in space. The sensor has 36 spectral channels making observations at three spatial scales: 250m [bands B1 (0.62–0.67 mm) and B2 (0.841–0.876 mm)], 500m (bands B3 to B7, from the blue to the shortwave infrared part of the spectrum) and 1 km (all remaining channels in solar and thermal domains). Several global products are available from the standard MODIS data processing system for terrestrial, atmospheric and oceanic applications. These products may need additional enhancements to make the best use of the MODIS imagery at regional scales (Luo et al. 2008). This is especially true for polar regions because the sinusoidal (SIN) or cylindrical (LAT-LON) projections used in generating level 2 and 3 MODIS products lead to image distortion (Khlopenkov and Trishchenko 2008). The spatially enhanced MODIS products can be obtained by selecting an alternative image projection that better preserves spatial distances and therefore image quality and image information content (Khlopenkov and Trishchenko 2008, Luo et al. 2008). An additional enhancement can be obtained by applying an image fusion (downscaling) technique (Trishchenko et al. 2006) to obtain all MODIS land bands B1–B7 at 250m spatial resolution to meet the GCOS requirements. The fusion method developed at the Canada Centre for Remote Sensing (CCRS) to generate the enhanced 250m MODIS clear-sky data products over the northern part of the North American continent centred over Canada (Luo et al. 2008) is expanded here to cover the entire Arctic circumpolar region (9000 km x 9000 km). This was initiated in the framework of the Canadian International Polar Year (IPY) programme to document the state of the Arctic environment from MODIS.

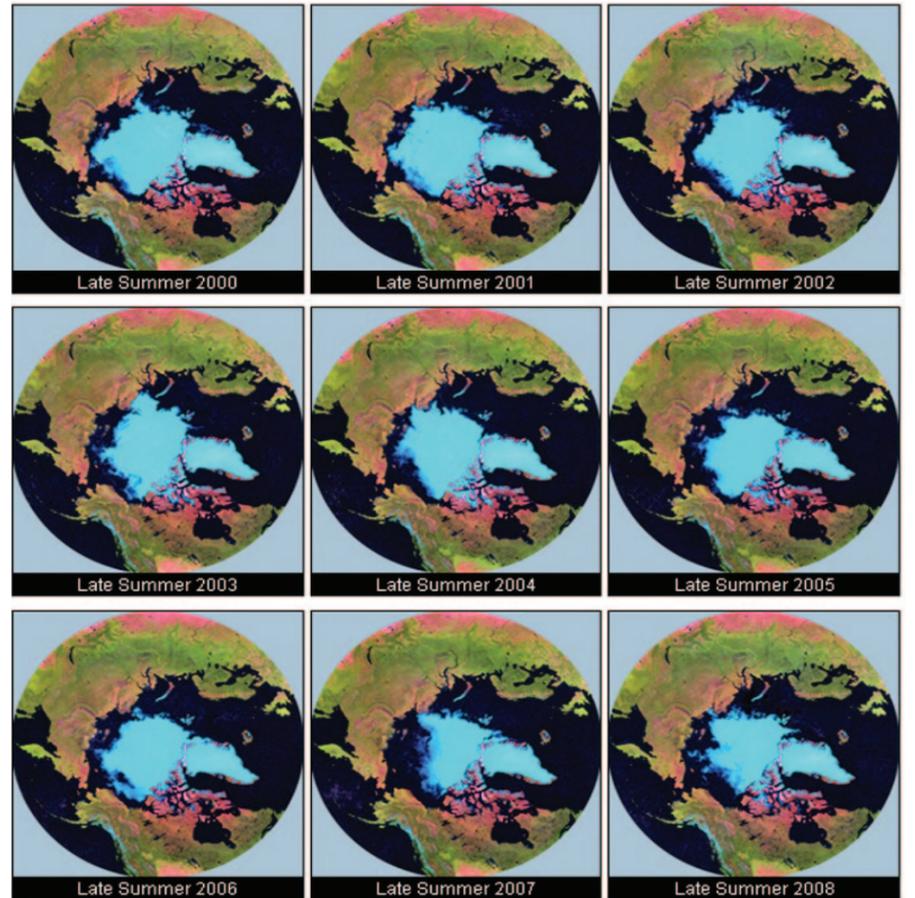
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Circumpolar Arctic mapping from MODIS 250m spatial resolution, 9,000 km x 9,000 km