Improved downscaled soil moisture product by masking precipitation

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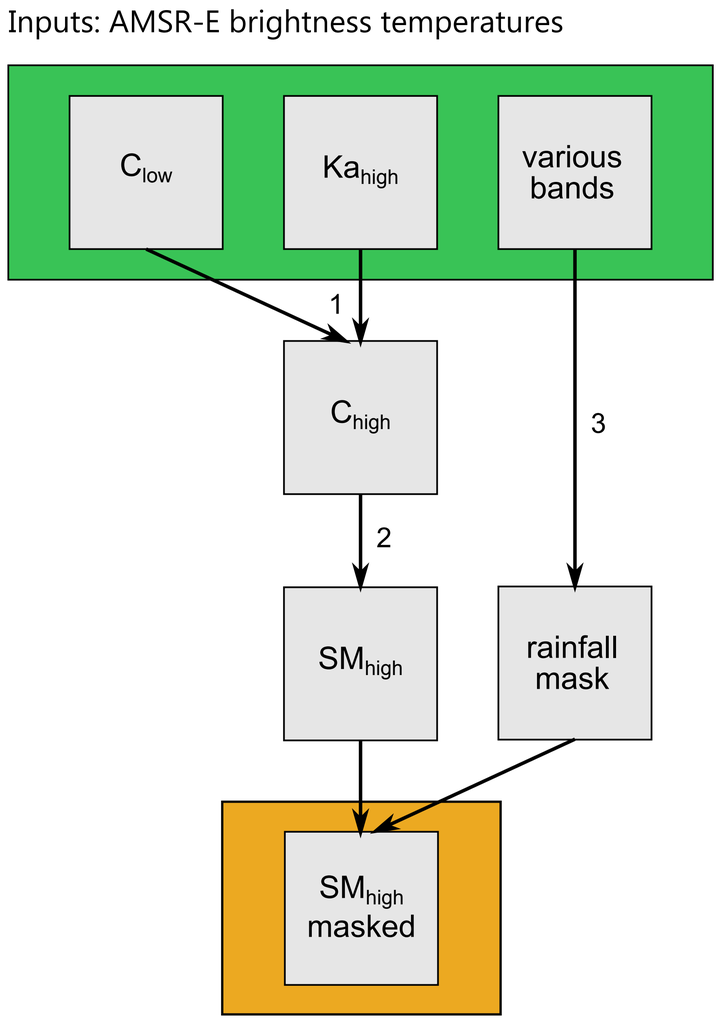
Introduction

- Satellite-borne passive microwave radiometers are used to measure various land surface parameters, such as soil moisture.
- Low frequency bands are the most sensitive to soil moisture, but have limited potential for regional studies due to their relatively coarse resoluton of ~50 km.
- Higher frequency bands can be used to increase the resolution to ~10 km by a modulation technique. However, higher frequencies are more sensitive to precipitation, which can introduce errors in the soil moisture product.
- To reduce errors due to precipitation, a rainfall mask is applied to the downscaled product.

The overall **aim** of this research is to develop and validate an improved downscaled soil moisture product based solely on brightness temperatures.

Methods

The following scheme gives an overview of the methodology used to create the downscaled soil moisture product:



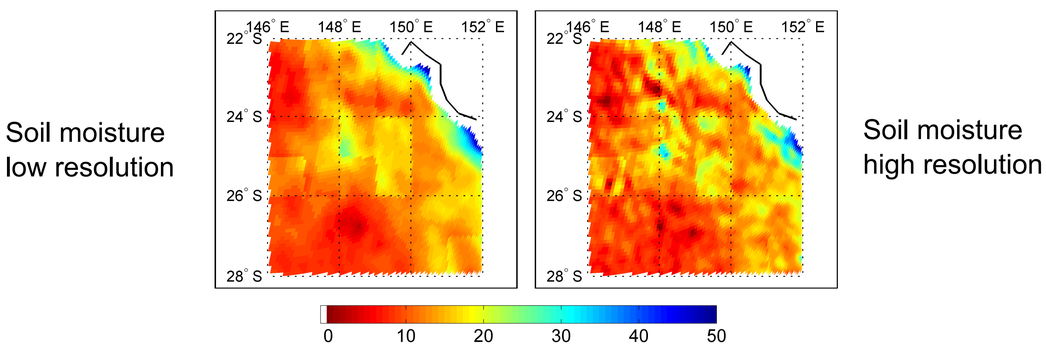
1 - Smoothing Filter-based Intensity Modulation technique for downscaling brightness temperatures (Santi 2010)

2 - Land Parameter Retrieval Model to calculate soil moisture (i.e. de Jeu and Owe 2003)

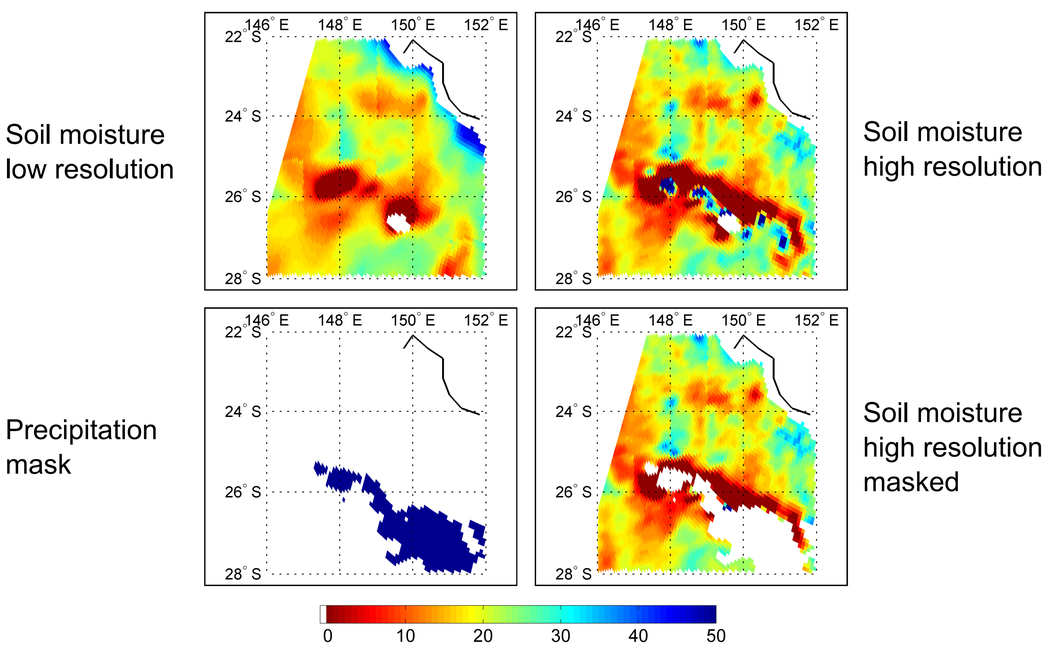
3 - Precipitation detection as in Kummerow et al. 2001 and masking of desert and semi-arid areas as in Ferraro et al. 1994. Of the various precipitation detection algorithms that were tested, these proved to be the most accurate over our chosen study area: the Australian continent.

Results

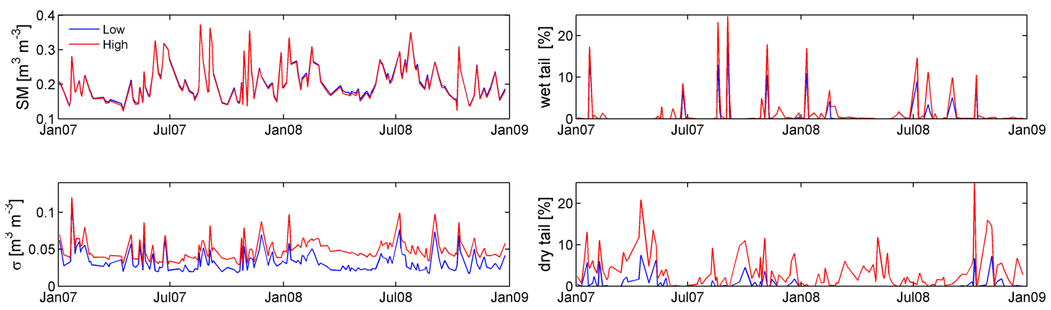
Downscaling on a day without precipitation:



Downscaling on a day with precipitation:



Effect of downscaling soil moisture on catchment conditions (de Jeu et al. 2014):



Future work

- Further **improve accuracy** of the product, for example by masking areas immediately surrounding precipitation areas

- Expand the soil moiture dataset to include **AMSR-2**.

- **Validation** of the downscaled and masked downscaled product.
  - The study area is the Australian continent, with special attention for the Murrumbidgee catchment.
  - In situ soil moisture and evapotranspiration datasets as well as high resolution evapotranspiration estimates produced by the AWRA model will be used for validation.
  - Focus on spatial validation as well as temporal validation.

- Investigate the effect of the new product in **hydrological models**
  - Using soil moisture information in inputs for discharge modeling
  - Data assimilation studies

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