**Satellite-based microwave global land emissivity estimation and its application for freeze/thaw detection**

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**Abstract:** Reliable land surface emissivity estimates play key role in retrieval of several atmospheric variables associated with land surface processes, and in numerical weather prediction data assimilation for weather/climate process studies. Remote sensing of land emissivity from microwave satellite sensors are proven to be reliable and cost-effective in the last three decades. A long-term record of satellite-based land emissivity estimate using a common algorithm is crucial to study its variability at different scales and applications towards land surface processes. Freeze and thaw process is one of most important phenomena in the high-latitude regions, which is sensitive to surface temperature, land cover types and soil moisture. The use of passive microwave emissivity in freeze/thaw states detection is supposed to be more promising, because emissivity is free from atmospheric effects and can be used as real representative of the surface state change. Instantaneous land surface emissivity will be estimated from the AMSR-E and AMSR2 sensors for mid-2002 to 2015 using near simultaneous ancillary data sets and employing a robust algorithm. The potential of estimated land emissivity in freeze/thaw states detection will be investigated in detail.