The 36th International Symposium on Remote Sensing of Environment,
11 – 15 May 2015, Berlin, Germany, ISRSE36-486

Multi-temporal Air Temperature Estimation Scheme (MATES)

B. Bechtel [a, *], K. Zakšek [b]

[a] Institute of Geography, Center for Earth System Research and Sustainability, University of Hamburg, Hamburg, Germany – benjamin.bechtel@uni-hamburg.de
[b] Institute of Geophysics, Center for Earth System Research and Sustainability, University of Hamburg, Hamburg, Germany – klemen.zaksek@zmaw.de

THEME: ATMC

KEY WORDS: Land surface temperature, air temperature, thermal infrared, MODIS

ABSTRACT:

Remote sensing based land surface temperature has widely been used for the spatial interpolation of near ground air temperatures and such methods are well established for daily parameters like daily mean, minimum, and maximum air temperature. The estimation of higher resolution time series such as hourly values is, however, considerably more difficult due to the complex surface energy budget and resulting differences in the diurnal cycles of air temperature and surface temperature. A further limitation is the coarse spatial resolution of geostationary land surface temperature which results in a mismatch between the radiometric footprint of the sensor and the turbulent footprint of corresponding in situ measurements. To address both shortcomings a multi-temporal air temperature estimation scheme (MATES) is proposed. In a pilot study it was shown that the use of multi-temporal surface temperatures considerably improves the estimation of near ground air temperature from geostationary satellite observations and enables a quarter-hourly now-cast for individual stations with an RMSE of less than 2 K. In this study, these findings were confirmed and deepened using a more comprehensive data set of 1097 stations in Europe. It was shown that air temperature can be estimated with a comparable accuracy for most parts of Europe except for Scandinavia and regions with complex terrain. Additionally, first attempts to produce spatially comprehensive estimates of air temperature are presented which include the use of thermal surface parameters derived from the entire MODIS archive (MOD11A1). Further, methods to automatically select the best predictor sets and improve the estimation are presented.

* Corresponding author. This is useful to know for communication with the appropriate person in cases with more than one author.