Surface Temperature Downscaling based on Genetic Particle Smoother

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Thermal infrared (TIR) data are efficiently used for surface fluxes estimation giving the possibility to assess energy budgets through surface temperature. However, an accurate knowledge of such data at high spatial/temporal resolution is not possible considering the present instruments on board satellites. In fact, available instruments allow either the high spatial resolution with a low temporal one (e.g. ***ASTER***: repeat cycle of *15* days/spatial resolution of *15m* to *90m*) or the high temporal resolution with a coarse spatial one (e.g. ***SEVIRI***: repeat cycle of *15min*/spatial resolution of *3km*). Then, it is necessary to develop methodologies to combine these multi-scale and multi-temporal data to better monitor fluxes at appropriate scales. Our approach consists in the development of a new downscaling method based on the Genetic Particle Filter (*GPF*) or more precisely Particle Smoother (PS) to extract sub-pixel variables from large scale data measurements. This methodology consists in constraining surface temperatures trajectories simulated by a dynamic model and aggregated at the scale of the observations. The ***SETHYS*** land surface model [1] was used for that purpose. The first step was to develop and test our approach on a synthetic database based on the French "Crau-Camargue" region landscape and climate. A heterogeneous pixel containing *4* different land cover types equally distributed (bare soil, prairie, wheat and rice) was considered. The results of PS LST downscaling approach [2] applied on the synthetic database showed good performances. It has also been shown that *PS* performances decrease with observation error amplitude and rise with observation frequency. The second step was to apply the *PS* downscaling approach on real data and at larger scale (a whole image and not only a pixel) and compare its performances to other approaches [3, 4]. Some assumptions were considered on the spatial correlation between pixels in a first time (no correlation). The comparison based on the assimilation of *METEOSAT-**SEVIRI*** *C*oarse *S*patial *R*esolution ***(CSR)*** observations and the efficiency of the downscaling method compared to ***ASTER*** *H*igh *S*patial *R*esolution ***(HSR)*** images will be presented.

References

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