



## Modeling the angular dependence of satellite retrieved Land Surface Temperature (LST)

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Satellite retrieved values of Land Surface Temperature (LST) over heterogeneous pixels may strongly depend on the viewing and illumination angles as well as on the characteristics of the land cover, raising the need to formulate models that allow adjusting the temperature values to a common viewing geometry. The aim of the present study is to develop a geometrical model that allows estimating LST of a given pixel for any viewing and illumination angles. For this purpose we have relied on the Boolean model, which gives the gap probability between objects within a layer, given the density of object centers and its average area. The Boolean model was used to estimate the fraction of each pixel that is covered by each of the following three “pure” components: sunlit background, shaded background and vegetation. Estimates of the average covered area by canopies and by shadow are derived from projection of a single arbitrarily-shaped vegetation element (e.g. ellipsoidal or conical trees) onto a fine scale regular grid.

The model was validated using data obtained within the framework of the EUMETSAT Satellite Application Facility on Land Surface Analysis (LSA-SAF) that since 2005 has been disseminating, in near real time and on a 15-minute basis, estimates of LST based on SEVIRI instrument on-board Meteosat Second Generation (MSG). The model was applied to time-series of in situ observations of upwelling radiation fluxes as obtained from the LSA-SAF validation site in Évora (Portugal). Measurements are performed by three radiometers that allow discriminating between sunlit background and vegetation. Data are supplied every 2 minutes and respect to the years of 2011 and 2012. The temperature of the shaded background was obtained using an empirical model based on relationships between air temperature, the temperature of the sunlit background and the temperature of vegetation. The resulting composite temperature was finally compared against LST values, as retrieved from MSG. Obtained results show negligible bias and a RMSE of about 1.5K.