**A multi-resolution daily air temperature model for France from MODIS and Landsat thermal data**

Climate change and urbanization expose a growing number of people to health risks due to increased ambient temperature (Ta). Chronic and acute Ta exposure are associated with increased mortality and morbidity, especially among vulnerable populations such as the elderly and infants. Understanding and monitoring these risks requires spatially- and temporally-resolved Ta at high resolutions. This is challenging both in rural areas, which have large spatial extents and often few weather stations, and urban areas, where the complex built environment can produce temperature variation at scales of a few hundred meters.

The first phase of my PhD focused on developing a statistical model of daily minimum, maximum, and mean Ta from 2000 through 2016 at a base resolution of 1 km2 across continental France and at an increased resolution of 200 x 200 m2 over large urban areas. For the 1 km model we use linear mixed models to calibrate the relationship between Ta measured at weather stations with land surface temperature (LST) and NDVI from the MODIS instrument on the Terra and Aqua satellites, elevation, population density, and land cover. We then fill gaps due to cloud cover or instrument errors with a second set of linear mixed models that estimate modelled Ta based on nearby station measurements. To increase the spatial resolution over large urban areas, we replace MODIS NDVI and LST with monthly 17-year composites of NDVI and thermal imagery from the Landsat 5, 7, and 8 satellites. We then train an ensemble of random forest and gradient boosting regression models to predict the residuals of the 1 km model.