



Land surface temperature measurement with an infrared camera, in-situ emissivity measurement

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Mobility in adverse winter conditions is a recurring problem that affects economy. The massive salting of roads affects the ecology of soils, surface waters and groundwater. To mitigate this alteration of ecosystems and to implement sustainable winter maintenance, thermal mapping of roads is a solution that enables to predict the risk of ice occurrence and snow accumulation and to limit the salting to what is strictly necessary. To achieve an unbiased result it is necessary to know the thermal behaviour of the road.

In order to measure the surface temperature of the road with a radiative method, its emissivity and the radiation from the half space seen from the surface have to be determined. Since the thermal and environmental characteristics of the road may change along the section considered, the temperature measurement must be carried out on the entire road. This method is conventionally called "thermal mapping". It consists in measuring the radiation emitted from the road using an apparatus set on a vehicle embedded into the traffic. It is important to have an accurate value of the directional emissivity of the monitored surface in the spectral band and in the direction the detector aimed.

This study presents in-situ directional emissivity measurements in both broadband and in the specific spectral band of the infrared camera that was used. Spectral measurements have also been made in laboratory with several apparatus.

These directional emissivity values have been used to correct the surface temperature measurements made along the roadway in Paris (France). Land measurements and an aerial thermography campaign have been simultaneously carried out. These data were compared with those acquired by a radiometer. Another campaign has been carried out in the Namibian desert in June 2017 to compare land surface temperature with satellite measurements from ESA (European Space Agency). Results indicated a good agreement between the data collected by the different methods. Emissivity measurements have been made too, providing valuable information on pavement radiative properties.