

THERMAL MAPPING AS A VALUABLE TOOL FOR ROAD WEATHER FORECAST AND WINTER ROAD MAINTENANCE: AN EXAMPLE FROM THE ITALIAN ALPS

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ABSTRACT:

During the winter period ice is likely to form on roads, making pavement surfaces slippery and increasing accident risk. Road surface temperature (RST) is one of the most important parameters in ice formation. The LIFE+ “CLEAN-ROADS” project aims to forecast RSTs in advance in order to support road maintenance services in the timely and effective preparation of preventive anti-icing measures. This support is provided through a novel MDSS (Maintenance Decision Support System). The final goal of the project is to quantitatively demonstrate that the implemented MDSS is capable to minimize the consumption of chemical anti-icing reagents (e.g. sodium chloride) and the associated environmental (water and air) impact while maintaining the current high levels of road safety.

In the CLEAN-ROADS system RSTs have been forecast by applying the numerical model METRo (Model of the Environment and Temperature of Roads) to a network of RWIS (Road Weather Information System) stations installed on a test route in the Adige Valley (Italy). This forecast is however local and does not take into account typical peculiarities along road network, such as the presence of road sections that are particularly prone to ice formation. Thermal mapping, i.e. the acquisition of mobile RST measurements through infrared thermometry, permits to (i) identify and map those sections, and (ii) extend the forecast from a RWIS station to adjacent areas. The processing of thermal mapping signals is however challenging because of random variations in the road surface emissivity. To overcome this we have acquired several thermal mapping traces along the test route during winter seasons 2014-2015 and 2015-2016. We have then defined a “characteristic” thermal fingerprint as a function of all its historical thermal mapping signals, and used it to spatialize local METRo forecasts. Preliminary results suggest the high potential of such a technique for winter road applications.