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RAMSES: a nowcasting system for mitigating geo-hydrological risk along the railway

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In recent years, a number of exceptional rainfall events of short / very short duration (from 15 minutes to about 2 hours) caused incidents and service interruptions due to landslides, collapses of bridges, and erosion of the ballast, along the Calabrian railway.
RAMSES (RAilway Meteorological SEcurity System) is a pilot CNR project, recently co-funded by RFI S.p.A. and aimed at mitigating the risk along the railway. Forecasting of weather events responsible of heavy convective rainfall, even when provided with some advance, is not generally performed with reliable localization. In fact, objective limits of the numerical weather prediction derive from grid resolution, often exceeding the size of convective cells. These phenomena, whose recurrence periods seem to show a reduction due to climate changes, affect limited areas and are characterized by a very short life cycle. As a consequence, failures of hydraulic crossings are increasingly being recorded together with landslide-related debris invasion along the drainage network and slopes.
RAMSES aims at improving short term (3-6 hours) weather forecasts and ground effects at local scale. The employed approach is base on synergistic and integrated operational tools to provide weather information on small-size basins. The system will also allow to promptly identify and track the short-term evolution (15-60 min) of convective cells, by means of imaging techniques based on quasi-real time radar and Meteosat data. The extension of the temporal horizon of the forecast up to three hours will be performed by using the Local Analysis and Prediction System (LAPS) model. This latter employs, as a "first guess", the output of the WRF numerical model: such analyses are updated and improved by means of observational data from different instruments (e.g. on land weather stations, radar, satellites, etc.). Finally, the assessment of ground effects will be accomplished for selected study areas, by means of landslide susceptibility mapping combined with hydrological, rainfall-runoff and hydraulic flow modeling.