RISICO: A decision support system (DSS) for dynamic wildfire risk evaluation in Italy

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The system RISICO provides Italian Civil Protection Department (DPC) with daily wildland fire risk forecast maps relevant to the whole national territory since 2003. RISICO support the activities relating to Italian national forest fires warning system and National fires fighting air fleet. The RISICO system has a complex software architecture based on a framework able to manage geospatial data as well as time dependent information (e.g, Numerical Weather Prediction, real time meteorological observations, and satellite data). Within the system semi-physical models, able to simulate in space and time the variability of the fuel moisture content, are implemented. This parameter represents the main variable related with the ignition of a fire. Based on this information and introducing information on topography and wind field the model provides the rate of spread and the linear intensity of a potential fire generated by accidental or deliberate ignition. The model takes into account the vegetation patterns, in terms of fuel load and flammability. It needs territorial and meteorological data. Territorial data used by the system are vegetation cover and topography. Meteorological data are mainly represented by Numerical Weather Prediction (Limited Area model). Meteorological data provided in real time by a meteorological network are also used by the model as well as satellite data (e.g., vegetation index, snow cover). The output information are provided on a web-gis based system according with the OGC-INSPIRE standard. In 2007 the system has been improved introducing some changes both in the model structure and its functionality. Spatial resolution is increased up to 100m in the implementation at regional level. The fine fuel moisture model has been changed, introducing the FFMC of the CFFDRS with some slightly differences. In addition, a different nominal rate of spread (no-wind on flat terrain) has been introduced for each different class of vegetation. The operational chain of the RISICO system is considerably changed. In the first release the system run daily making use of observations only to define the initial state of the dead fine fuel moisture content. The new version of the system is able to run each 3-h making use of observations at each time step. In order to validate the RISICO system, the information obtained from the analysis of really occurred fires has been compared with the information generated by RISICO system. In particular, a data set of more than 11000 wildland fires occurred in Italy between 01/01/2007 and 31/12/2008 has been considered in the validation procedure. The performance indexes selected in order to measure the system effectiveness are relevant to the capability of identifying the correct danger classes with reference to the extension and duration of the fire. In this connection, a comparison between the performance obtained by the new release of the RISICO system and the previous one has been carried out highlighting separately the improvement given by the higher resolution, the model structure and the operational chain. The system RISICO is able to integrate the main Fire Hazard Indexes present in the literature providing a suitable tool for testing the different indexes on the same platform in different environmental and climatic conditions. Risico represents an operational approach to forest fires management both during the prevention and fire fighting phases. The prevention phase represents the main goal for the DPC. Prevention starts with a daily bulletin issue. The bulletin is based on RISICO data, forecast, meteorological data and other observed data such as active fires. The bulletin is dispatched to all operative bodies employed both in fire fighting and civil protection activities. During the fire fighting activities Risico support decision maker to define the best strategies. The objective of the paper is to promote the use of Fire Hazard Forecast as operational tool in fire risk prevention and management and to provide know-how for standardisation of the fire hazard "mapping" or "alert" systems in Europe. This work was funded by the Italian Civil Protection.