S²IGI: an integrated system for Forest Fires management

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KEY POINTS

- *Fire detection, fire hazard assessment, burned areas, fire propagation.*

1 INTRODUCTION

Although fires are a natural component of the ecosystems dynamics, uncontrolled fires cause extensive environmental damage with a significant economic impact, especially in southern Europe and around the Mediterranean, where they pervasively threaten most of the vegetated land. On average, indeed, ca. 65'000 fires burn ca. 500'000 hectares (ha) of wild land and forest areas yearly, over 85% of which are located in the European Mediterranean region (European Commission, 2014).
Forest fires are in fact the main source of threat and degradation to vegetated areas in the Mediterranean Regions. In Italy, although the high interannual variability of the phenomenon, in average (JRC, 2017) they kept steadily above ca. 5500 fires and ca. 50.000 hectares per year in the last decade. The management of this phenomenon is the objective of the S²IGI (Sistema Satellitare Integrato Gestione Incendi) project, that aims to provide an early detections of wildfires, an accurate forecast of wildfire propagation and an assessment of damages, performing based on the use of advanced technologies (EO data exploitation).
In particular, the main goal of S²IGI is the development of added-value products based on satellite images, in-situ ancillary data and weather numerical predictions, together with a dedicated decision support system providing also the user graphical interface, the Service Provision Interface, which can effectively support the firefighting activities along the three phases which can be distinguished in the fire contrasting activity:

1) forecast/prevention,
2) monitoring/detection/counteract/propagation prediction,
3) damage assessment/recover.

These products are derived from previous EU and national RTD projects, in which, for many years, the partners of project team have been involved. The same products have been extensively evaluated during the training and the demonstration period of past projects as shown by Laneve et al., 2006, Ghisu et al., 2014.
In particular, for example, the prevention and recovery products were tested by end-users on the following pilot areas: Minho (Portugal), Messenia (Greece), Andalucía (Spain), Sardinia (Italy) and Corse (France) (Laneve et al., 2017). Crown sourcing data will be also tested as additional source of information during the emergency phases.

S²IGI project will be developed encompassing the following main principles:

a) to define, make and demonstrate a functional architecture, accounting for all types of operational scenarios of fire-related emergencies at local, regional and national level, respectively;
b) to customize and implement into the system the whole set of unsupervised, fire-oriented EO techniques prioritizing the exploitation of the Copernicus data and products;
c) to explore, test, and implement into the system if appropriate, innovative unsupervised techniques for fire detection and burn scar mapping adopting advanced algorithms;

d) to provide the overall system with relevant, quantitative decision support functionalities, as the near-real-time straightforward modeling of fires in controlled environment under known boundary conditions.

Fires occurring in the Mediterranean area are rarely significant in terms of burning products released in the atmosphere. Nevertheless, they have a dramatic impact on the extension of vegetated areas in regions with relatively scarce vegetation and on human lives and infrastructure.
This paper is devoted to introduce the S²IGI pilot project describe the intended products and respective validation methods (cf. Figure 1). S²IGI is a three years lasting project funded by Sardegna Ricerche as part of the POR-FERS framework.

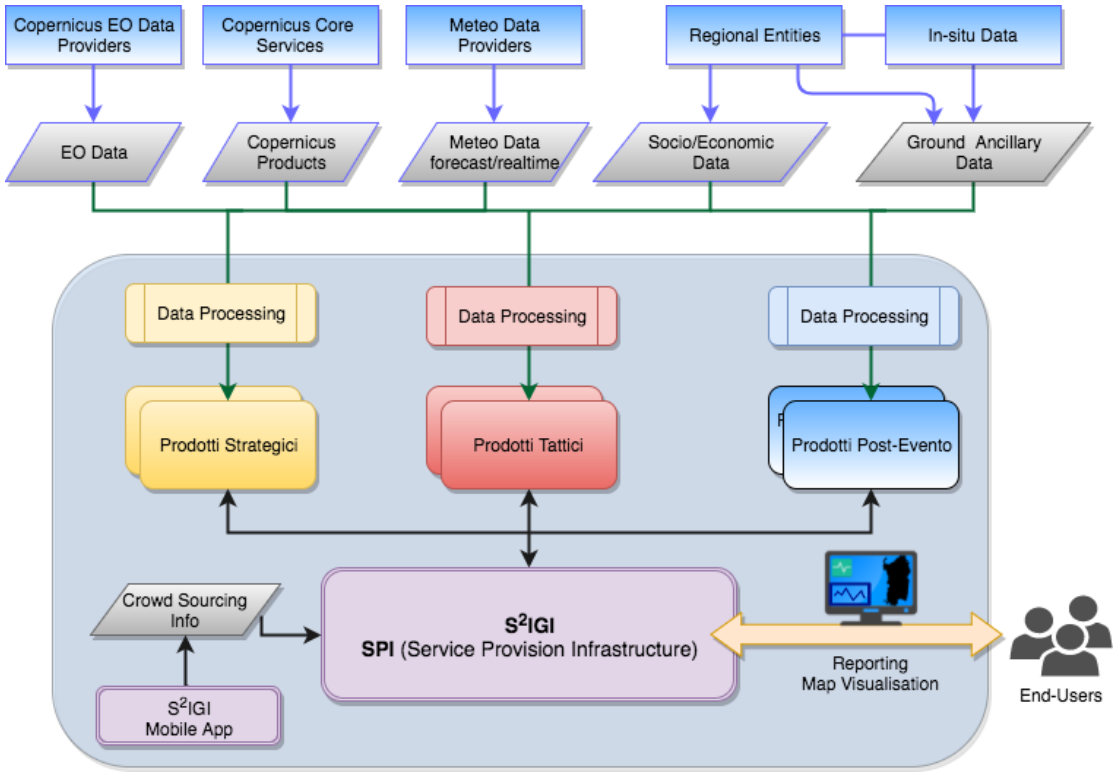

Figure 1. System architecture of the project.

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