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Exploiting Sentinel 2 data for mapping wind storm damages in forested areas. Case Study: the event of October 2018 occurred in Northeast Italy

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This work aimed at exploiting optical satellite data for mapping the effects of the wind storm that hit the Northeast Italy between the 27 and the 30 October 2018. During the storm, wind gusts up to 192 km/h were recorded (ARPAV, 2019). The event produced significant damages in forested areas, where several trees were flattened. The objective of this work was to implement a methodology to map the affected area in which trees were destroyed. To this end, multitemporal data acquired by the Sentinel 2 constellation (Level-2A products) were exploited. This task has been formalized as a change detection problem and from a methodological perspective it was addressed through a supervised classification approach. In particular, the adopted technique is based on the integration of two popular approaches for remote sensing image analysis, namely support vector machine and Markov random fields, and it is able to integrate in the classification process the spatial-contextual information associated with the input imagery (Moser and Serpico, 2013). A pair of Sentinel 2 images was used in the analysis: a pre-event image (dated 31/10/2017) and a post-event image (dated 15/11/2018). Before applying the above-mentioned change detection methodology, the images were pre-processed for masking out, in both scenes, all the pixels that were likely to produce false errors in at least one of them (e.g., clouds, clouds shadows, dark areas, snow). To achieve this objective, the classification masks provided in each Sentinel 2 product were used. In order to minimise the effect of the phenological cycle, from the images there were masked out all the pixels that were not classified as “Coniferous Forest” according to the CORINE Land Cover 2012 product. The rationale is that all the changes occurring in the remaining “not masked” area are due to the effect of the wind storm on the coniferous forests. Importantly, during the elaboration only the spectral bands retaining a spatial resolution of 10 m were used. Classification results were qualitatively validated by means of a visual inspection. Because of the extraordinary nature of the event, many national and international news agencies reported the news and facilitated the dissemination images and videos (e.g., collected by unmanned aerial vehicles) that were also used for validation. Findings showed that the methodology that was implemented successfully allowed the identification of the forested areas damaged by the wind storm.

References:
- ARPAV, 2019: http://www.arpa.veneto.it/ - Accessed: 01/10/2019
- Moser, G. and Serpico, S. B.: Combining support vector machines and markov random fields in an integrated framework for contextual image classification, IEEE Transactions on Geoscience and Remote Sensing, 51, 2734–2752, 2013.