The Semantic Pixel: a common ground for integrating multiple satellite images

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Abstract. Usually, images can be seen as sets of pixels or as fields over a reference space. While the former view allows image processing to function using pixel manipulation algorithms, the second one is closer to a wider understanding of what people perceive in an image. This paper discusses some semantic challenges related to integration of image data from various sources, in the context of a global forest monitoring research project, considering both views. Such integration is necessary, considering that by 2015 a new generation of remote sensing satellites based on free and open data policies is expected to become operational, so researchers will have access to more data than they can handle with current techniques. We propose the integration of images from multiple satellites starting from a common point, which we call the semantic pixel. It will enable scientists to have access to large sets of satellite images and their metadata, regardless of source or format. The semantic pixel will also enable access to ancillary data, which is essential for advanced temporal analysis of the forest cover dynamics, including major sets of natural resource maps, such as vegetation, soil and geological maps. Other data encoded as fields, such as digital elevation models, relevant climatic variable maps, political maps and associated census data, can also fit this model.

Keywords: Satellite imagery, information integration, semantics, environmental data, remote sensing