Crowd-driven tools for the calibration and validation of Earth Observation products

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In recent years there has been a rapid diffusion in open access Earth Observation (EO) data available at global scales to help scientists address planetary challenges including climate change, food security and disaster management. For example, since 2016 the European Space Agency (ESA), via its Sentinel-2 satellites, has been providing frequent (5 day repeat cycle) and fine-grained (10 meter resolution) optical imagery for open and public use. As such, the EO community is faced with the need to design methods for transforming this abundance of EO data into well-validated environmental monitoring products. To help facilitate the training and validation of these products (i.e. land cover, land use), several crowd-driven tools that engage stakeholders (within and outside the scientific community) in various tasks, including satellite image interpretation, and online interactive mapping, have been developed. This paper will highlight the new results and potential of a series of such tools developed at the International Institute for Applied Systems Analysis (IIASA), namely the Geo-Wiki engagement platform, the LACO-Wiki validation tool, and Picture Pile, a mobile application for rapid image assessment and change detection. Through various thematic data collection campaigns, these tools have helped to collect citizen-observed information to improve global maps of cropland and agricultural field size, to validate various land cover products and to create post natural disaster damage assessment maps. Furthermore, Picture Pile is designed as a generic and flexible tool that is customizable to many different domains and research avenues that require interpreted satellite images as a data resource. Such tools, in combination with the recent emergence of Citizen Observatories (i.e. LandSense, GROW, GroundTruth 2.0, SCENT funded by Horizon2020), present clear opportunities to integrate citizen-driven observations with established authoritative data sources to further extend GEOSS and Copernicus capacities, and support comprehensive environmental monitoring systems. In addition, these applications have considerable potential in lowering expenditure costs on in-situ data collection and current calibration/validation approaches within the processing chain of environmental monitoring activities both within and beyond Europe.