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Ubiquitous and continuous SAR imaging for natural hazards: present and future of remote sensing

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Constellation of optical and SAR sensors have achieved unprecedented performances: dense constellation of cubesats - like the next constellation of 88 Dove satellites (Planet labs), launched simultaneously this February - reduce the revisit time to nearly daily. This brings great value to many domains, like the assessment of risk and damage in natural hazards, post-earthquake response, real time flood monitoring. The limits to optical imaging due to cloud coverage could then be removed with drones.
Alternatively, decades of coherent exploitation of Synthetic Aperture Radars have demonstrated their unique capabilities in precise deformation monitoring, penetration in canopies and subsurfaces (glacier and deserts), 3D imaging of volumes, sensitivity to soil moisture and generation of water vapor maps. Thanks to these capabilities, for one, early warning was possible for a landslide at Bingham Canyon Mine (one of the largest in history), whereas monitoring of infrastructures, natural gas and carbon dioxide storage reservoirs, dams, mines is already an established business.
Many of these applications are made possible by the Sentinel-1 SAR constellation, the first to provide systematic coherent acquisitions and free and open data. More than 50000 products are downloaded daily. Nonetheless, the present revisit times of this constellation (1-3 days), or the future 6 hours of Cosmo-SKYmed I and II constellations, will leave a gap that cannot be fruitfully exploited for early warning of landslides, real time mapping of flooding, hydrometeor forecasts, real-time regional alerts of collapse, continuous soil moisture mapping for precision farming. On the other side, the limited penetration capabilities of C-band (Sentinel-1) and X band (Cosmo, TerraSAR constellations) would not allow sufficient penetration to monitor volumes, like ice, sands and forests.
In order to fill these gaps, two novel SAR systems are under study and will possibly appear in the next decades: geosynchronous systems and bistatic constellations.
The geosynchronous SAR exploits the geostationary orbit to create a hundred kilometers wide real antenna, fixed in the sky, if relative to the ground. If one satellite is exploited, the full antenna would be spanned in twelve hours, and images of medium resolution (ten meter or so) could be got every one-two hours, and finally coarse resolution products, like water vapor or soil moisture maps for flash-flood now-casting, could be generated every fifteen minutes.
However, thanks to the intrinsic possibility of phase coherence of the microwaves, a constellation of mini or microsatellites could be deployed to act as a single instrument. Power and resolution would improve with the number of satellites squared, and the revisit would be reduced to minutes. This would be a unique system to provide day-and-night, all-weather imaging capabilities with the additional coherent Radar capabilities to monitor deformations, water-vapor, volumes, soil moisture.
The bistatic SAR companion is a passive satellite (or a constellation of) flying in close formation with an active one. Such a system would provide the same capabilities of present TanDEM-X constellation, but enhanced to 3D volume penetration if L band is used.