RADAR OPTIONS FOR GLOBAL EARTHQUAKE MONITORING

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Abstract

Interferometric synthetic aperture radar (InSAR) can provide maps of surface displacement in the radar line of sight direction with accuracy at the centimeter level. Such data can provide key information for the solid earth science community studying the physics of earthquakes. Provided enough spatial and temporal resolution it is conceivable that InSAR can be useful in relation to future schemes to predict earthquakes. However, such ambitious Earth Science Visions require order of magnitude improvements in the temporal resolution of present InSAR capabilities.

This paper discuss two different approaches to meeting such future requirements. A fairly large constellation of low earth orbit (LEO) satellites would be the conventional approach to achieve the desired temporal coverage. A small configuration of geosynchronous SARs would be a second approach to achieving the same goal.

The paper will outline typical LEO and geosynchronous SAR designs and baseline parameters. In both cases L-band is considered, as this band provides a good compromise between the desire to drive the frequency down to lower interferometric decorrelation on the one hand and to increase the frequency to avoid problems with frequency allocation, interference, and ionosphere on the other hand. Key trade-off considerations will be discussed. The unique capabilities of a geosynchronous SAR in terms of instantaneously assessable area will be contrasted with the requirements for huge electronically steered array (ESA) antennas. The conclusion is that the optimal approach is very much dependable on technological developments, in particular geosynchronous .SAR depends on the development of affordable very large ESA antennas, but also other technological developments will be required.

Suggested topic categories:
(*) NASA Earth Science Vision session
(B.15) NASA's Earth Observing System
(F.02) Advanced Passive & Active Sensors