Opportunity for an Australian Ground Motion Data Infrastructure

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SUMMARY

In this presentation we will discuss the opportunity to develop the first ever national-scale mapping of Australia's ground surface motion as a new digital research infrastructure. The European Space Agency's Sentinel-1 constellation mission has collected radar images over the entirety of Australia every 12 days since 2016. This rich radar dataset can be transformed into ground surface motion time series with millimetre precision using a method known as Interferometric Synthetic Aperture Radar (InSAR); a mature Earth observation technology that has been applied in Earth science research since the early 2000's. The methods to transform InSAR data into vertical land motion (subsidence or uplift) data have already been applied and demonstrated in the Australian context to study the impacts of groundwater extraction and subsurface mining at local scales (e.g. Fuhrmann and Garthwaite, 2019, Garthwaite and Fuhrmann, 2020). For example, Garthwaite and Fuhrmann (2020) observed subsidence of 60 cm accumulate over a 2-year period in 2015-2017 above the Tahmoor coal mine in New South Wales. Now that computational power is more readily available for Big Data processing the proposed ground motion data infrastructure is now feasible at national scale, having been demonstrated in many other countries and continents globally, including Europe where users now have open access to a "service" with data at sub-kilometre spatial and two-weekly temporal resolutions across Europe. There is also a mature global InSAR service industry that can be leveraged to produce the ground motion data products. This industry has been engaged in New Zealand, for example, where GNS Science has partnered with a UK InSAR company to produce country-wide ground motion from Sentinel-1. An Australian ground motion data infrastructure would revolutionise our understanding of the natural and human-induced motions of the Australian continent over the last decade and enable new research in coastal sea level rise, infrastructure monitoring, resource extraction, land management, natural hazards, and urban planning. Users in governments, academia and industry would benefit from having access to a ground motion reconnaissance portal showing the millimetre-scale

movements of individual locations with tens of metres spatial resolution. Furthermore, it would stimulate additional opportunities for industry, through raised general awareness of the technology and its applications, and opportunities to value-add by supplementing the freely available Sentinel-1 data with commercial satellite radar data at identified ground movement “hot spots”.□ □References□Fuhrmann, T.; Garthwaite, M.C. Resolving Three-Dimensional Surface Motion with InSAR: Constraints from Multi-Geometry Data Fusion. Remote Sens. 2019, 11, 241. https://doi.org/10.3390/rs11030241□Garthwaite, M. C., Fuhrmann, T. Subsidence monitoring in the Sydney Basin, New South Wales: results of the Camden Environmental Monitoring Project. Record 2020/16. 2020, Geoscience Australia, Canberra. http://dx.doi.org/10.11636/Record.2020.016□