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SMART characterisation of New Zealand's aquifers using fast and passive methods

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Groundwater resources account for about half of New Zealand's abstractive water needs and supplies about eighty per cent of all water used in the agricultural sector. Despite the importance of New Zealand's groundwater resources, we still lack essential information related to their basic properties such as volume, hydraulic properties, interaction with surface water, and water age. These measures are required to ensure sustainable management in order to avoid overexploitation of water resources and to circumvent water scarcity situations where humans and the economy will be stressed due to insufficient water supply. A newly established research collaboration between New Zealand and Europe aims to provide a methodological framework to characterise New Zealand's groundwater aquifers. The SMART project (www.smart-project.info) will rely on existing data sources of regional councils and research institutes and will develop novel measurement techniques that can be applied to large areas with little effort, little acquisition time, and minimal cost. The project aims to synthesise in situ measurements from sensor observation services, ambient noise seismic tomography, real-time fibre optic temperature sensing, novel age tracers, airborne geophysical surveying and satellite remote sensing techniques. Validation of direct and indirect groundwater information will be achieved through use of multiple methods in case study areas and by "ground-truthing" the new methods against existing data obtained from traditional methods (e.g. drilling, aquifer pump testing, river gauging). An important overarching part of the project is the quantification of uncertainty associated with all techniques to be employed. An online Sensor WebGIS prototype will provide the project results and other case study observations (e.g. temperature, precipitation, soil moisture) in as near real-time as possible. These datasets serve as a validation source for the satellite monitoring results and present an actual view on the status of the environment. The web portal will not only visualise near real-time (station based) point measurements but also process these datasets to spatially distributed maps on climatological parameters. The OGC compliant and open source based portal will be developed towards a 3D groundwater interface and inventory. This inventory will be tailored to stakeholder needs (e.g. open access, ease of use, and interoperability with existing systems) which have already been identified through stakeholder consultation processes. The portal prototype runs on a platform-independent web browser ensuring access and visibility to all stakeholders and decision makers at regional and national level.