SOIL MOISTURE MAPS OF TASMANIA – USER NOTES:

The University of Sydney in conjunction with the Department of Natural Resources and Environment Tasmania, and AgLogic have developed an automated Soil Moisture Mapping system of Tasmania. The soil moisture maps are near real-time statewide grid surfaces (80 m resolution) showing the most recent daily average soil moisture (in volume fraction of soil or m³/m³). The two maps represent estimated proportion of soil water content at the surface (0-30 cm depth) and subsurface (30-60 cm depth). These maps are updated daily (in certain condition, there could be a delay due to the availability of the SMAP products); and can be viewed here: https://sdi.tas-hires-weather.cloud.edu.au/shiny/.

The maps are generated using deep learning models trained on 39 soil moisture monitoring stations across Tasmania (courtesy of AgLogic and Tas Farming Forecaster project). The model's architecture follows long-short term memory approach and is combined with a transfer learning technique referring to the trained Australian model.

The predictions were driven by the dynamics of SMAP (Soil Moisture Active Passive) dataset, daily rainfall and air temperature, in combination with static variables: multilevel of soil properties (Soil Organic Carbon, Clay content, Available Water Capacity), Land Use and Elevation. The deep learning model was calibrated using the 39 monitoring stations within period of January 2022-July 2023.

A leave-one station-out cross validation technique evaluated the performance of models. Based on the validation scheme, the averaged mean absolute error (MAE) across all recording stations is about 0.07 m³/m³ for prediction at both layers. This indicates that soil moisture values in these maps are likely to have an average difference about 0.07 m³/m³ compared with values measured using moisture probes.

Disclaimer:
Our models were trained based on limited data observation in Tasmania state. Only 6 out of 39 stations have more than one-year records of soil moisture data. Also, we highlighted that the sample stations are in the area with low soil organic carbon (less than 16%). This resulted unreliable estimated soil moisture value for subsurface layer over the area with very high organic carbon content. On the subsurface map, these areas are indicated by 0 values, including Southwest region of the state.
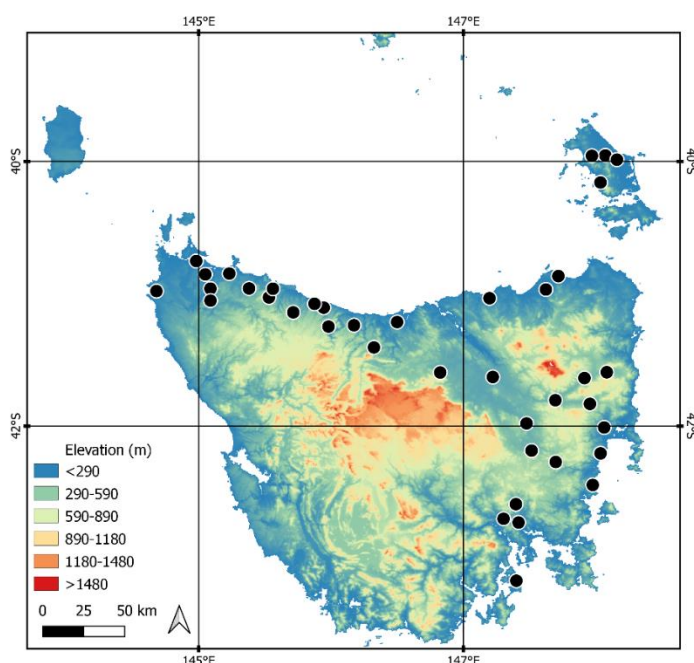

Figure 1. Black dots represent soil moisture probes used in generating the soil moisture map models.

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