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Selection and integration of Earth Observation-based data for an operational disease forecasting system

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The current increase in the volume and quality of Earth Observation (EO) data being collected by satellites offers the potential to contribute to applications across a wide range of scientific domains. It is well established that there are correlations between characteristics that can be derived from EO satellite data, such as land surface temperature or land cover, and the incidence of some diseases. Thanks to the reliable frequent acquisition and rapid distribution of EO data it is now possible for this field to progress from using EO in retrospective analyses of historical disease case counts to using it in operational forecasting systems.

However, bringing together EO-based and non-EO-based datasets, as is required for disease forecasting and many other fields, requires carefully designed data selection, formatting and integration processes. Similarly, it requires careful communication between collaborators to ensure that the priorities of that design process match the requirements of the application.

Here we will present work from the D-MOSS (Dengue forecasting MOdel Satellite-based System) project. D-MOSS is a dengue fever early warning system for South and South East Asia that will allow public health authorities to identify areas at high risk of disease epidemics before an outbreak occurs in order to target resources to reduce spreading of epidemics and improve disease control. The D-MOSS system uses EO, meteorological and seasonal weather forecast data, combined with disease statistics and static layers such as land cover, as the inputs into a dengue fever model and a water availability model. Water availability directly impacts dengue epidemics due to the provision of mosquito breeding sites. The datasets are regularly updated with the latest data and run through the models to produce a new monthly forecast. For this we have designed a system to reliably feed standardised data to the models. The project has involved a close collaboration between remote sensing scientists, geospatial scientists, hydrologists and disease modelling experts. We will discuss our approach to the selection of data sources, data source quality assessment, and design of a processing and ingestion system to produce analysis-ready data for input to the disease and water availability models.