Summary Note 4: Observational rainfall datasets in Nepal

Motivation

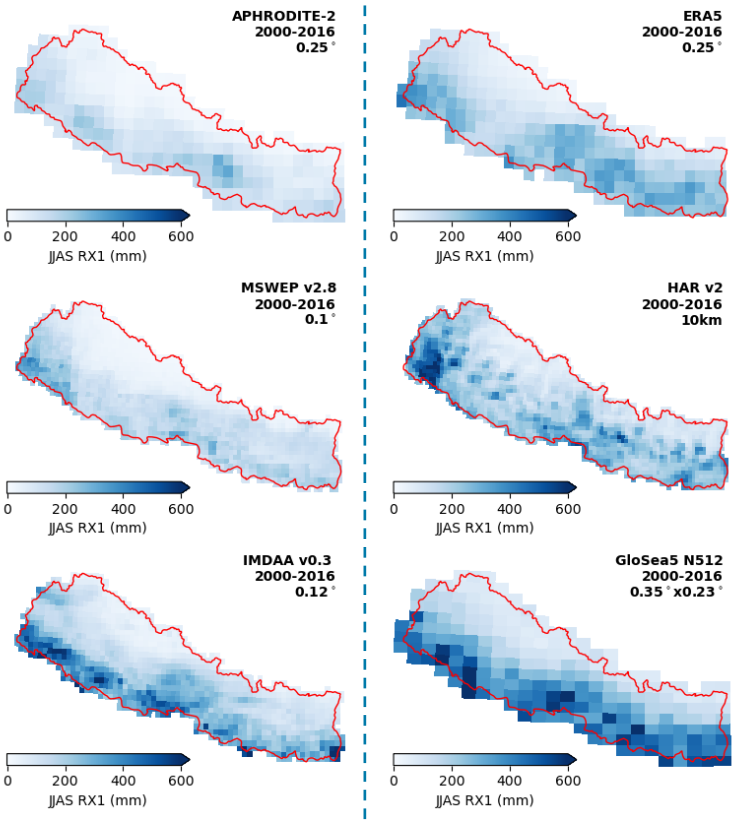
Observational datasets are crucial to help us understand the present-day risk of extreme rainfall events. For the hydropower sector, they are key to assess the profitability of a development. However, Nepal's complex terrain makes it one of the most challenging countries to collect weather observations. This means that currently observed precipitation extremes do not paint a full picture of what could happen in our current climate.

▲ *The basis of observational datasets are measurements of the atmosphere from either surface-based weather stations or satellites orbiting the Earth*

Station data vs gridded data

Individual weather stations provide specific measurements at individual locations, but often we want to compare rainfall across a region or country. For this, we use station data extrapolated onto a regular grid. This provides us with consistent and spatially continuous estimates of rainfall, averaged over each grid cell. Different extrapolation methods and/or different combinations of types of observation give us different types of gridded datasets.

Do current observational datasets agree on the magnitude of present monsoon extremes?



Different observational datasets of the present-day climate show similar **patterns** of high and low monsoon rainfall extremes, but they disagree on the **amount** of extreme rainfall.

Relying on an **individual** dataset to estimate return periods (such as a 1-in-50-year event) is likely to give misleading results. This makes knowing "*how extreme the extremes can be*" uncertain.

Using **multiple** datasets to estimate extreme return periods will give more reliable estimates.

Including **seasonal forecast** information will help us estimate extreme events that haven't been observed before, but that are still possible in the present-day climate (see Summary Note ***).

◀ *Wettest single monsoon day per grid-cell (June – September, JJAS) between 2000 – 2016 for observational data based on rain gauges and satellite rainfall estimates (left column); and rainfall estimates from combined weather models and gauge/satellite estimates (right column).*

It's hard to subjectively say which individual dataset is best. Each dataset has strengths and weaknesses. They each represent different views of the same monsoon rainfall. Taking all datasets into account, looking at where they agree and disagree, will give a more reliable estimate of extreme rainfall and enable us to say how certain or uncertain these extreme estimates are. Better observations will help the hydropower sector make more reliable assessments of electricity production.

Next Steps

The Met Office will work on developing a consensus dataset of the current climate, for JJAS 1-day rainfall extremes (Tx1day), that accounts for similarities and differences in extreme rainfall observations over Nepal. This will be a gridded dataset and will allow us to make comparisons of observed rainfall extremes across Nepal, and compare the current and future climate.

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