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# Canadian Precipitation Analysis (CaPA): Integration of satellite precipitation data

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CaPA (Canadian Precipitation Analysis) is a system developed by Environment Canada to produce real-time gridded precipitation estimates on a sub-daily basis. This is accomplished through the use of statistical interpolation to combine gridded precipitation from Environment Canada's Global Environmental Multiscale (GEM) model with synoptic weather stations. The goal of CaPA is to produce a temporally and spatially accurate representation of precipitation, benefiting many hydrological applications including the forecasting of floods, agriculture, climatic studies, and use as a resource.

In areas across Canada, the network density of weather stations can be quite low, limiting the accuracy of any simple interpolation method. This is especially concerning where the area between stations is large enough to contain entire events, such as convective storms which contribute large amounts of precipitation over small areas. The project investigates the inclusion of satellite data from Precipitation Estimation from Remote Sensing Information using Artificial Neural Networks (PERSIANN) and the Climate Prediction Center MORPHing (CMORPH) technique into CaPA, in an attempt to capture events that would otherwise go unnoticed.

The project consists of three parts, where the first is an evaluation of the performance of PERSIANN and CMORPH over Canada. As observational data, the Second Generation of Daily Adjusted Precipitation for Canada (APC2) is used on the daily scale, and unadjusted synoptic data is used on the sub-daily scale. Measures of mean bias and categorical scores show spatial and temporal trends in the performance of the satellite data, warranting some pre-processing before its integration. The second part of the project is the pre-processing of the satellite data, which includes a bias removal and an identification of optimal areas and times to include. Since CaPA uses the GEM model as the background field, it does not require the satellite data to be continuous in space or time, which is ideal considering the difficulties measuring snowfall. The final part of the project is an evaluation of the effects on the CaPA output, being a combination of the GEM model, synoptic weather stations and satellite data. This evaluation is a comparison of the change in skill between the new experimental output and the current operational output.