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## Skill assessment of sub-seasonal forecasts of different atmospheric variables related to extreme precipitation events over Italy

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Extreme precipitation events (EPE), especially those leading to floods and landslides, are devastating to society. Predicting these events in advance can help disaster managers to carry out plans of action to respond effectively to any oncoming adverse events. Sub-seasonal forecasts, which aim to predict the weather with 2 weeks to 2 months in advance, can help to provide valuable and actionable information to disaster managers. Given the potential usefulness to end users, it is vital to assess the skill of sub-seasonal forecasts in predicting EPEs. However, given that precipitation is known to be a difficult variable to predict, the lead time at which forecasts are skilful may be limited. This study, therefore, aims to assess at which lead time sub-seasonal forecasts of atmospheric drivers of EPEs are skilful.

The study investigates the skill of the European Centre for Medium-Range Weather Forecast (ECMWF) sub-seasonal reforecast in predicting EPE over Italy from 2001 to 2020. A total of 100 EPEs are used as case studies. The variables evaluated are total precipitation, mean sea level pressure, geopotential height at 500 hPa and specific humidity at 850 hPa. Variables are averaged over the 5 days surrounding the date of the EPE. ERA5 is used as the reference dataset. Both deterministic and probabilistic metrics are used to assess the skill of the reforecast.

Results show that the skill for precipitation is limited to the first two weeks. Nevertheless, the ECMWF sub-seasonal product is skilful in predicting the atmospheric fields associated with the selected EPEs, such as MSLP and geopotential height, showing both reliability and discrimination beyond two weeks.