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Distributions of the streamfunction and velocity potential in the Tibetan Plateau region in China

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The Tibetan Plateau region is a complicated topography highlighted by the Tibetan Plateau, Henduan Cordillera, and Sichuan Basin. Combined effects of its topographic features provides a preferred location for the formation of vortices of different scales, such as the southwest vortex which is responsible for most torrential rainfall events in southwest China. Many studies focused on studying the individual effect of these different topography to have a better understanding of the scale and location of those vortices.

Streamfunction and velocity potential are useful scalar representations of flow fields, and they are powerful tools for studying fluid dynamics. Cao and Xu (2011) designed numerical schemes based on the integral formulae of the Green's function for solving the streamfunction and velocity potential. Their methods are accurate and efficient even for limited domains with irregular boundaries and inner data holes which often occurs when the analysis surface of constant height or pressure is lowered and intercepted by mountains.

With the purpose to see the individual effect of the topographic features of the Tibetan Plateau region from the perspective of the streamfunction and velocity potential, three sets of experiments with different topography are designed. EXP_ALL performs calculations under the background of the real topography, EXP_TH contains the Tibetan Plateau and Henduan Cordillera, and EXP_TP contains only the Tibetan Plateau. Observational velocity datasets from the Third Tibetan Plateau Atmospheric Scientific Experiment (TIPEX III) in China are used together with the NCEP reanalysis data to see the similarities and differences between different datasets.