Research progress in the scientific investigation of the Yarlung Tsangbo Grand Canyon

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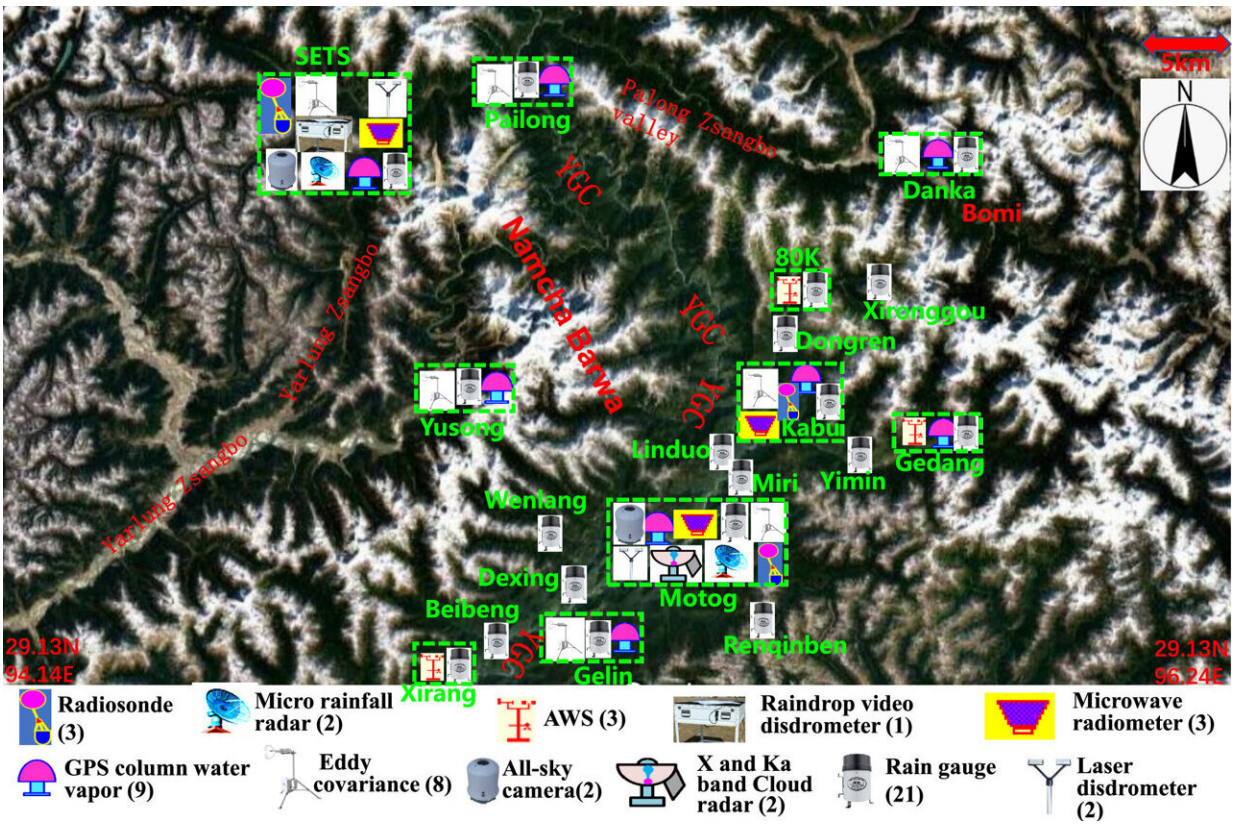

Locations and types of instrumentation at the observation sites around the YGC. The numbers in parentheses indicate the number of each instrument that was used in the experiment. Credit: *Atmospheric and Oceanic Science Letters* (2024). DOI: 10.1016/j.aosl.2024.100462

The Second Tibetan Plateau Scientific Expedition and Research Program (STEP) established a scientific expedition team for the water vapor channel of the Yarlung Tsangbo Grand Canyon in the southeast of the Tibetan Plateau. In the past five years, the expedition team has conducted observations and research on water vapor transport and heavy precipitation around the Yarlung Tsangbo Grand Canyon.

The expedition team has used the observational data to achieve a series of important scientific achievements. Recently, Atmospheric and Oceanic Science Letters published a review article on the research progress of the Yarlung Zsangbo Grand Canyon water vapor channel. Specifically, the article reports the research progress on heavy rainfall processes related to water vapor transport in the Grand Canyon.

The first author of the article, Prof. Chen Xuelong from the Institute of Tibetan Plateau Research, Chinese Academy of Sciences, explains that the rainfall observation network established by his team in the Grand Canyon can represent the spatial impact of the terrain on hourly precipitation in the region.

The microphysical characteristics of precipitation in the southeastern Tibetan Plateau are significantly different from those in low-altitude areas, further confirming the unsuitability of cloud microphysical parameterizations in current precipitation numerical models for the Tibetan Plateau region.

Satellite-measured precipitation data may provide new insights into the spatial distribution of mountain precipitation, but the results of the investigation team have shown that there is a problem in the form of a dry bias in GPM satellite precipitation data in the Grand Canyon region and calibration is required before use. The Yarlung Zsangbo Grand Canyon, as an important water vapor source for the Tibetan Plateau, has not been fully understood in previous studies regarding its impact on the

precipitation of the Tibetan Plateau.

Thus, the article also provides a quantitative analysis of the impact of meridional water vapor transport passing through the Grand Canyon on the precipitation of the Tibetan Plateau. On this basis, it is found that the decrease in precipitation over the southeastern Tibetan Plateau may be due to the decrease in meridional water vapor flux passing through the Grand Canyon.

The simulation of mountainous heavy precipitation has always been a difficult task in the precipitation forecasting community. As such, researchers in the expedition team used a numerical model and the established observational network data to test the advantages and disadvantages of different cloud precipitation schemes.

"The results showed that only when a 1-km resolution numerical model using specific cloud precipitation and terrain drag parameterization schemes is used can the wind field and water vapor transport in the Grand Canyon be captured. The model can make accurate predictions of nighttime heavy precipitation in the region, and this work provides an important reference for precipitation forecasting in mountainous regions," explains the corresponding author, Prof. Xuelong Chen.

More information: Xuelong Chen et al, Research progress on the water vapor channel within the Yarlung Zsangbo Grand Canyon, China, *Atmospheric and Oceanic Science Letters* (2024). DOI: 10.1016/j.aosl.2024.100462

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