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Precipitation origin in atmospheric rivers from a global perspective: first steps

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Atmospheric rivers (ARs) are filaments of enhanced moisture in the atmosphere, usually located in subtropical zones and mid-latitudes over oceanic areas. These structures are able to transport huge water vapor amounts, so that when they make landfall and the water vapor is forced upwards, they often cause heavy or even extreme rainfall, thus increasing the odds of catastrophic flooding. Given their potential effects on our daily lives, a better understanding of their physical properties is therefore needed.

One of the most studied and debated ARs properties in recent years is the origin of the moisture in them. Despite the numerous scholars dealing with this topic, moisture sources for precipitation in ARs have not yet been investigated from a global and climatological perspective. Here we present a first attempt to fill this gap by selecting different ARs events across the globe and subsequently simulating them with the FLEXPART model, enabled to calculate Lagrangian trajectories of individual air particles. In addition, we use state-of-the-art techniques to process and bias-correct FLEXPART outputs in other to accurately estimate precipitation origins. Our preliminary results reveal that ARs can tap from multiple moisture sources and that the contributions of the latter vary widely from case to case. Therefore, we conclude that moisture uptake in ARs is more complex and varied than previously known.