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Understanding moisture recycling for atmospheric river management in Amazonian communities

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The invisible atmospheric transports of moisture have recently attracted more research efforts into understanding their structures, processes involved and their function as an ecosystem service. Current attention has been focused on larger scale analysis such as studying global or continental level moisture recycling. Here we applied a water balance model to backtrack the flying river that sustains two local communities in the Colombian and Peruvian Amazon where vulnerable communities rely highly on the rainfall for agricultural practices. By utilising global precipitation (TRMM Multisatillite Precipitation Analysis; TMPA) and evapotranspiration products (Moderate Resolution Imaging Spectroradiometer MODIS, MOD16ET) as input data in the present modelling experiments to compensate the sparse ground observation data in these regions, the moisture recycling process targeting the two amazonian communities which has not yet been explored quantitatively has been shown. The TMPA was selected because of its proved comparativeness with observation data in its precipitation estimations over Amazon regions while the MOD16ET data was chosen for being validated by previous studies in the Amazon basin and for reported good performance. In average, 45.5 % of the precipitation occurring to Caquetá region in Colombia is of terrestrial origin from the South American continent while 48.2% of the total rainfall received by Peruvian Yurimaguas is also from the South American land sources. The spatial distribution of the precipitationsheds (defined previously as the upwind contribution of evapotranspiration to a specific location's precipitation) shows transboundary and transnational shares in the moisture contributors of the precipitation for both regions. An interesting reversed upstream-downstream roles can be observed when the upstream regions in traditional watershed thinking become downstream areas considering precipitationsheds and flying rivers. Strong seasonal variations are also detected by our results. Since undergoing rapid land cultivation expansion in the precipitationsheds of these study areas can potentially alter the moisture recycling process which sustains ecosystem and communities, the tele-connection linking the contributors and recipients presented in this study has highlighted that region-wise collaboration and communication will be essential for an adaptive Amazonia facing environmental change, especially in regards to its vulnerable communities.