Water vapor as an active scalar

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On time scales of a few days or less, tropical weather is subject to high-frequency, low-predictability phenomena, such as mesoscale convective systems and inertia-gravity waves. At longer time scales, sea surface and upper ocean temperatures start to exert control. In between, there may be an intermediate range of scales where free-tropospheric water vapor is an important source of memory. We suggest that the Madden-Julian oscillation is a “moisture mode” whose signal is carried primarily by water vapor. Tropical depressions may also be. To the extent this is so, there is a vague analogy between water vapor in the tropics and potential vorticity in the extratropics; something broadly similar to conservation and invertibility principles can be stated. Better delineation of how far these ideas can be pushed might even have practical utility for prediction.