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Storms and the distribution of ammonia in Jupiter's atmosphere

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Abstract

Ground-based radio-wave observations and the Juno spacecraft have shown that, contrary to expectations, the concentration of ammonia is still variable down to pressures of tens of bars in Jupiter [1, 2, 3]. While mid-latitudes show a strong depletion of ammonia, the equatorial zone of Jupiter has an abundance of NH3 that is nearly uniform. In parallel, Juno determined that the equatorial zone is peculiar for its absence of lightning, which is otherwise prevalent everywhere else in the planet [4]. We show that a model accounting for the presence of small-scale convection, ammonia dissolution in water ice, and storms driven by water condensation in Jupiter's atmosphere accounts for the observations. This new vision of the mechanisms at play which are both deep and latitude-dependent have consequences for our understanding of Jupiter's deep interior and of giant planets atmospheres in general.

References

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