MaxEnt and planetary climates: surely atmospheric dynamics matter?

T. E. Jupp[1]
(1) Mathematics Research Institute, University of Exeter, Exeter, UK
(t.e.jupp@exeter.ac.uk)

Abstract

Equator–to–pole heat transport in terrestrial planets results from complex atmospheric motions. Nonetheless, the macroscopic features of this transport can often be predicted simply by applying energy conservation and appealing to the MaxEnt formalism (which in this case corresponds to maximising the rate of thermodynamic entropy production – MEP). The apparent irrelevance of fluid dynamics is worrying - especially to fluid dynamicists. In this talk I shall present some recent results (Jupp & Cox, 2010) which suggest that dynamical constraints do not affect MaxEnt results for Earth, Mars, Venus and Titan and are, in this sense, irrelevant. For planets with different properties, however, it is shown that dynamical constraints would indeed affect the MaxEnt state of the atmosphere.

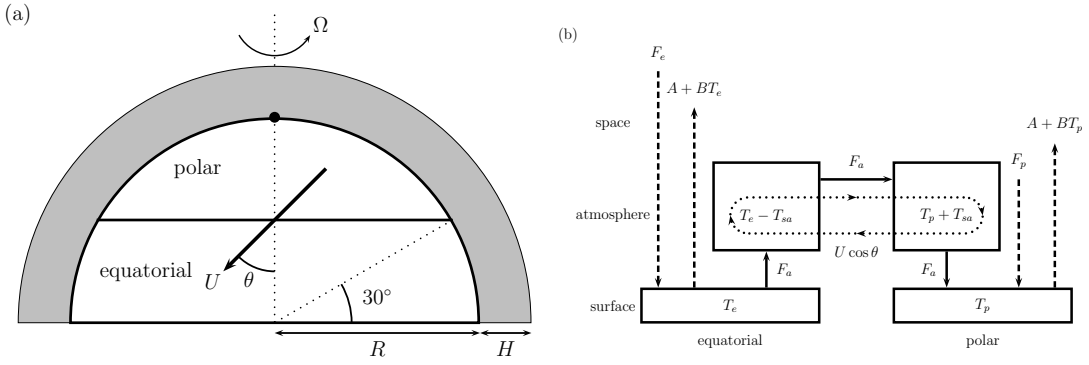

Figure 1: Simple model for equator–to–pole heat transport. (a) A surface wind U blows from pole to equator through an atmosphere of thickness H. (b) Schematic representation of the model. Dashed arrows – radiative energy fluxes, solid arrows – atmospheric energy fluxes, dotted arrows – atmospheric circulation.

References:

[1] T.E. Jupp & P.M. Cox Phil. Trans. R. Soc. B **365**, 1355 – 1365 (2010).

Key Words: MEP, planet, atmosphere, entropy