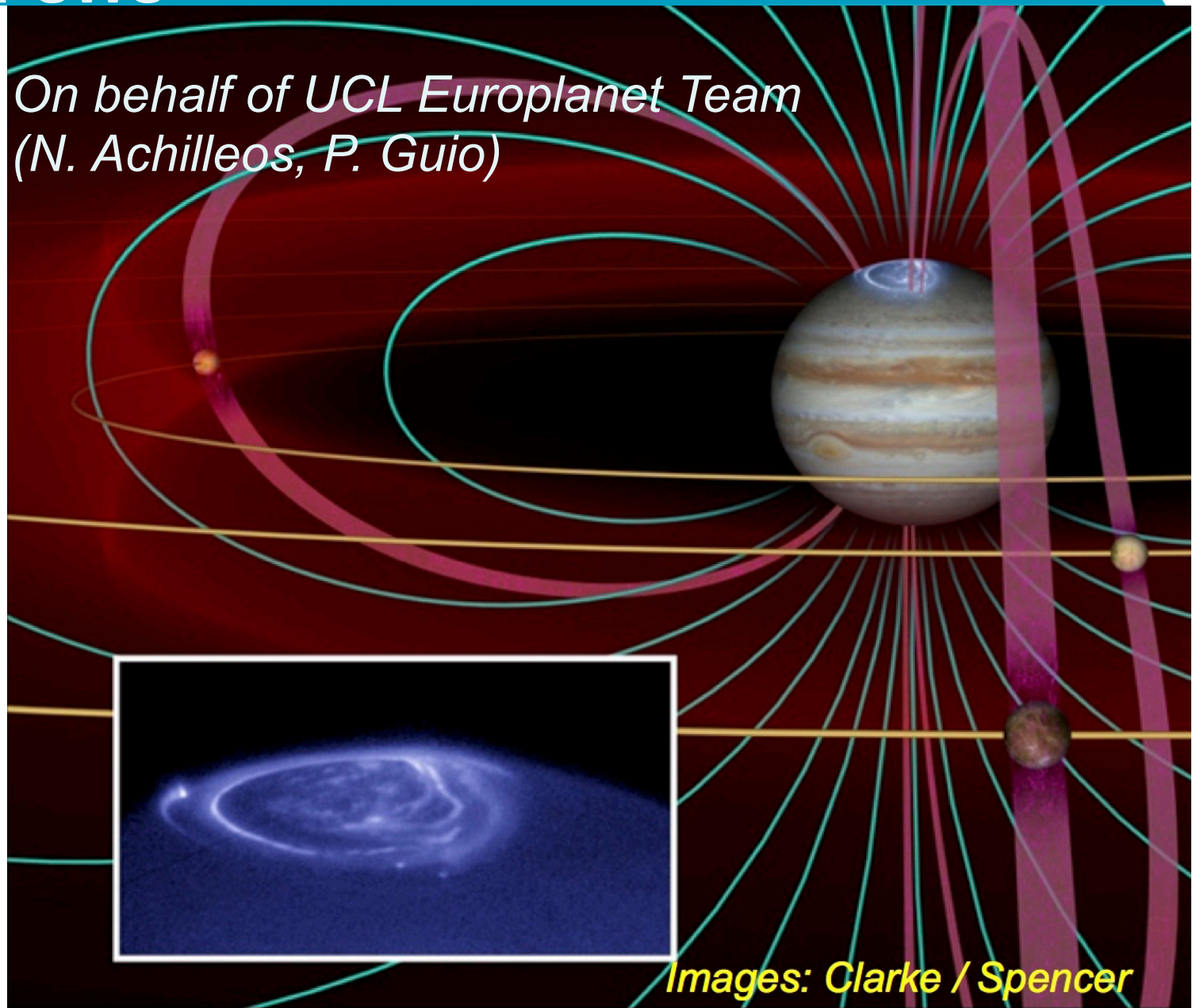
Overview: Giant Planet Model Outputs for PSWS



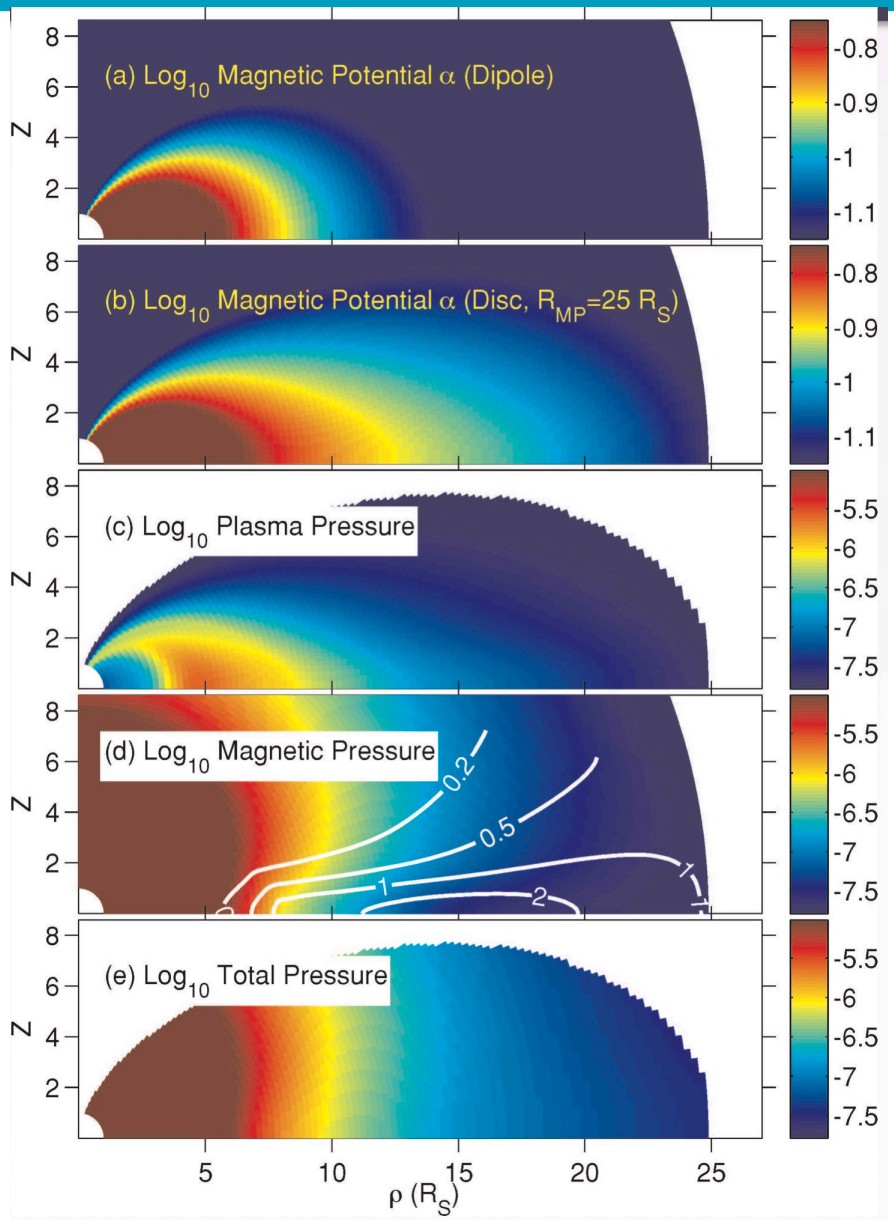
Approach

- Our proposed model outputs for PSWS will be based on two sources:

(1) The UCL Magnetodisc Model, which can provide axisymmetric models of this region for both the Jovian and Kronian magnetospheres.

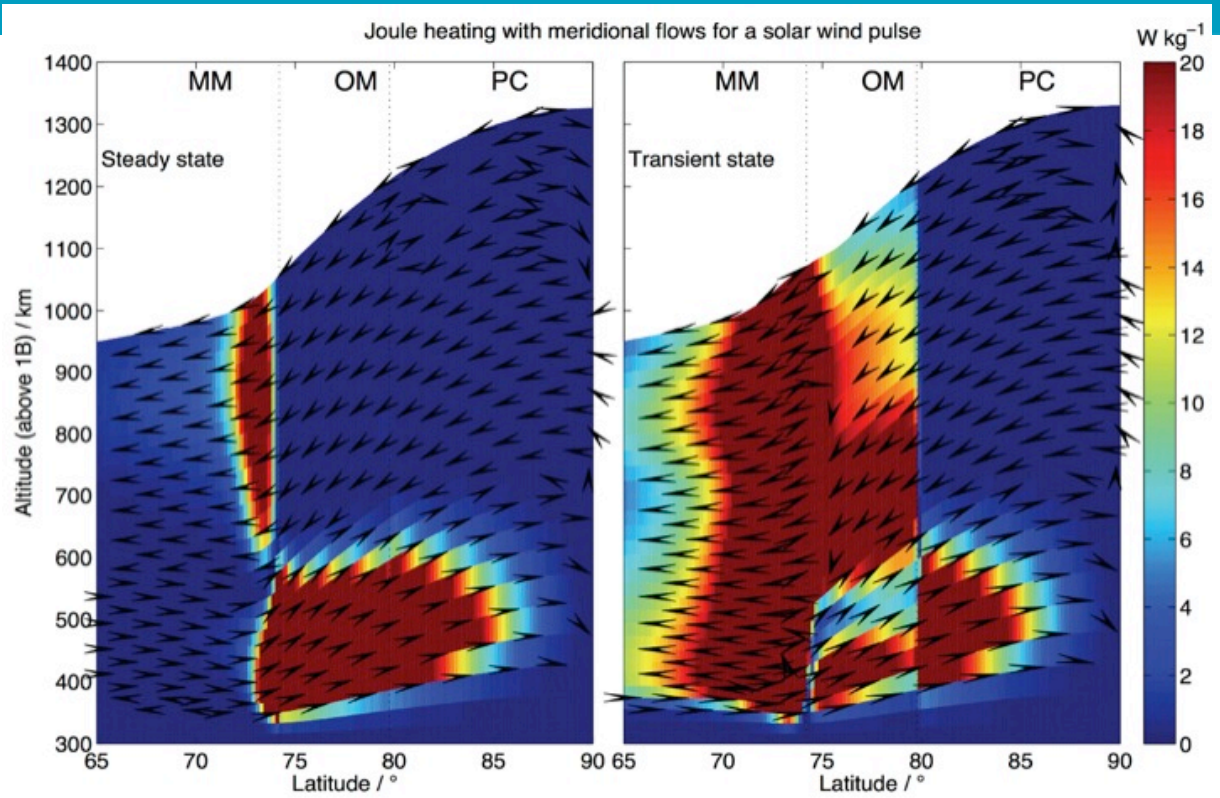
(2) The UCL '2.5D' axisymmetric model of the Jovian thermosphere, including the effects of magetosphere-ionosphere coupling (hence relevant to studies of 'planetary space weather').

Examples of Model Ouput



- Some outputs from UCL Saturn Magnetodisc Model (see *Achilleos, Guio and Arridge, MNRAS, 2010)*
- Model uses the formalism of *Caudal (1986, JGR) – force balance* between plasma pressure, magnetic (JxB) force and centrifugal force.
- Main model parameters are disc radius (linked to solar wind pressure) and hot plasma content (an internal 'driver')

Examples of Model Output



- ***Left Panel:*** *Yates, Achilleos, Guio (2012, PSS)* calculated *steady-state*, *axisymmetric* atmospheric models connected to different models of the middle magnetospheric flow and auroral region *(Nichols and Cowley, 2004; Grodent and Gerard, 2001)*.
- ***Right Panel:*** Time-dependent response of the model to a brief (~3 hour) Gaussian-type 'pulse' in solar wind pressure (disc radius) – see also *Yates et al (2014, PSS).* Output shown for time at the 'peak' of the pulse.

Work in Progress and Aims

- As part of our effort for VESPA, the UCL team are writing a ‘user guide’ document to the models. This document could of course be made available to all interested parties.

Baseline Functionality:

- We could compute first-order magnetodisc models which represent solar wind-dependent ‘perturbations’ by applying the same ‘angular momentum conservation’ for the disc as applied by *Yates et al (2014).*

- The caveat is that such models are valid only over a *limited range* of time scales for the solar wind event which ‘triggers’ the change in the planetary system.

- A ‘library’ of models could be constructed, according to parameters such as time scale of solar wind pressure change.

Work in Progress and Aims

How will this work as part of a 'PSWS Service'?

• A suggested simple approach would be to provide a library of models, according to relevant parameters, particularly *time scale* of the solar wind dynamic pressure event.

• Relevant PSWS predictions of solar wind dynamic pressure at giant planet orbits could then be (spectrally?) analysed to search for time scales in a similar range.

• If a certain critical 'fraction' of the signal power lies within the valid range of time scales, a corresponding set of model outputs could be retrieved from the library as a representative approximation of how the planetary thermosphere-magnetosphere system would respond – or at least to somehow place limits on the 'degree' of this response.

• The above is one possibility – we welcome any other suggestions.