MAS17-2017-000147

Bayesian Analysis of Whistler Mode Waves in the Radiation Belts[1]

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We show how Bayesian techniques provide a general data analysis methodology that is better suited to investigate phenomena that require a nonlinear theory for explanation. In general, the approach allows for a systematic methodology for introducing increasingly complex theoretical inputs into the data processing pipeline. We will apply these techniques to investigate whistler mode chorus, lightning-generated whistlers, and plasmaspheric hiss in the Earths radiation belts. We will demonstrate how Bayesian techniques allow for the direct competition of different physical theories with data acting as the necessary arbitrator. In particular, we use our recently developed self-consistent Hamiltonian model for whistler mode sub-packet formation to develop parametrized model functions that we use to investigate the sub-packet structure of chorus found in burst-mode data from the Van Allen Probe mission.