The Navy Highly Integrated Thermosphere Ionosphere Demonstration System (Navy-HITIDES): Stratospheric Warming, Tides and Annular Modes in a Whole Atmosphere with Ionospheric Effects

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We present novel results of a new atmosphere-ionosphere integrated system developed at the Naval Research Laboratory (NRL) that allows the investigation of lower atmospheric effects on the upper mesosphere, lower thermosphere and the ionosphere (UMLT-I). The Navy-HITIDES prototype is flexible enough to couple with any neutral atmosphere model, and for the purpose of this talk we have coupled Navy-HITIDES with the NCAR Whole Atmosphere Community Climate Model, extended version (WACCM-X); the underlying ionospheric model is the NRL SAMI3. We will illustrate the motivation for developing Navy-HITIDES, the engineering that makes this model flexible, portable and accurate. We discuss in detail simulations with Navy-HITIDES where the lower atmospheric meteorology is constrained by the prototype Navy high altitude atmospheric analysis (0-90 km), the advantages of nudging with high altitude analysis, as well as its limitations. Particular attention is devoted to the morphology of the UMLT-I, how it changes with stratospheric warming, resolution of tidal motion and annular modes.

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