Technical Page

Proposal Type: Regular
General Category: Terrestrial Aeronomy
Observation Category: 288 Hours

Proposal Title: Coupled Ionosphere/Thermosphere/Exosphere/Plasmasphere neutral density measurement initiative

ABSTRACT:
Quantification of neutral species densities in the upper thermosphere and lower exosphere requires reliable and consistent ground-based observations. The ground-based capability in turn demands reconciliation of known coupling mechanisms between the thermosphere, exosphere, ionosphere, and plasmasphere. The potential of specific airglow features utilized in this proposal to supply accurate values of $T_n$, $[O]$, and $[H]$ has been broadly demonstrated in the topside community, and the necessity of simultaneous and precise measurements now is realizable using the nested instrumentation at Arecibo. This measurement advance, together with the highly precise multiple ion ISR fitting breakthrough, is essential to obtain a comprehensive characterization of the various physical and chemical processes and dynamic behavior of the coupled neutral atmosphere and ionosphere. This goal is achieved through reconciliation of the proposed measurements with photoelectron and exospheric models, ion energy balance and charge exchange equilibrium theory.

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>E-mail</th>
<th>Phone</th>
<th>Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lara S Waldrop</td>
<td>Boston University</td>
<td><a href="mailto:lara@bu.edu">lara@bu.edu</a></td>
<td>617-353-7430</td>
<td>G</td>
</tr>
</tbody>
</table>

Service Observing Request

- [X] None
- [ ] All of the observing run.
- [ ] Part of the observing run.
- [ ] Queue Observing

Remote Observing Request

- [X] No
- [ ] Maybe
- [ ] Yes

Instrument Setup

430 CH radar

Atmospheric Observation Instruments:
Tilt-Photometer  Fabry-Perot  Ionosonde

Description of Observer Equipment: In addition to the two on-site Fabry-Perot instruments, a third
Fabry-Perot will be provided by R. Kerr of SSI and installed at Arecibo for the rest of 2003. A CCD camera is also included in this user-provided instrumentation. Details regarding its configuration are given in the text of the proposal.

**Special Equipment or setup:** For most nights, the required Arecibo radar observation is the incoherent scatter transmission at 430 MHz (topside mode) using the Carriage House receiver. On some of the nights we would like to use the new dual beam topside mode that is being proposed by Gonzalez and Sulzer if available. This mode takes advantage of the new data taking system to do dual beam experiments with one beam at zenith (looking at the topside) and the other beam swinging at 15 degrees. In this way F region drifts and gradients are obtained to complement the topside measurements.

**RFI Considerations**

**Frequency Ranges Planned**