The Geosynchronous Hurricane Observatory

**Technology**

- **Principle of aperture synthesis**
  - Frequency: 183 GHz
  - Antenna: 60 cm diameter, 10 cm hexagonal blank
  - Noise: 0.04 K (expected)

**Concept development**

- **Prototype**
  - Demonstrated in 2005

**Technology development**

- **183-GHz LNAs**
  - Receiver modules
  - Correlator & digitizer ASICs

**Science**

- **Gain [dB], Noise Figure [dB]**
  - 1.1, 1.0, 2.6, 0.8

**Mission plans**

- **Near-term**
  - GOES-R/S time frame
  - “Venture” mission
    - New NASA program
      - a) Venture-M: Full mission
      - b) Venture-I: Instrument only
      - 4-5 years rapid development
      - Venture-M AO in 2011, 2015, etc.
      - Venture-I AO in 2011, 2012, 2013, etc.

- **Long-term**
  - GOES-U time frame
  - “PATH” mission

**Design innovation**

- **Gain & Noise**
  - Demonstrated in 2005

**NASA’s investments in GeoSTAR are approaching $15M**

**A GeoSTAR mission will meet key NOAA needs re. NWP & hurricanes**

**Physical basis of microwave sounding**

**Mature products**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Horizontal</th>
<th>Vertical</th>
<th>Temporal</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tb (10 GHz)</td>
<td>25 km</td>
<td>5 km</td>
<td>5 min</td>
<td>3% AMR A</td>
</tr>
<tr>
<td>Water vapor</td>
<td>55 km</td>
<td>3 km</td>
<td>30 min</td>
<td>1.5%</td>
</tr>
<tr>
<td>Liquid water</td>
<td>25 km</td>
<td>3 km</td>
<td>30 min</td>
<td>0.5%</td>
</tr>
<tr>
<td>Snow</td>
<td>5 km</td>
<td>N/A</td>
<td>30 min</td>
<td>N/A</td>
</tr>
<tr>
<td>LWC</td>
<td>25 km</td>
<td>N/A</td>
<td>30 min</td>
<td>20%</td>
</tr>
<tr>
<td>SST</td>
<td>180 km</td>
<td>N/A</td>
<td>1 h</td>
<td>0.5 K</td>
</tr>
</tbody>
</table>

**Evolving experimental products**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Horizontal</th>
<th>Vertical</th>
<th>Temporal</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease rate</td>
<td>25 km</td>
<td>4 km</td>
<td>30 min</td>
<td>3%</td>
</tr>
<tr>
<td>Reflectivity</td>
<td>25 km</td>
<td>3 km</td>
<td>30 min</td>
<td>90%</td>
</tr>
<tr>
<td>Wind vector</td>
<td>25 km</td>
<td>2-3 km</td>
<td>30 min</td>
<td>FB</td>
</tr>
</tbody>
</table>

**Data products**

- **Synergy**
  - Complements GEO IR sounders (cloud clearing)
  - Complements LEO sounders (swath-gap & temporal-gap filling)
  - Complements GEO imagers (resolution enhancement of AMV)

**Hurricanes & severe storms**

- Warm core anomaly at 55 GHz (continuously, in real time)
- Radar-emulating reflectivity (continuous coverage of entire life cycle)
- Convective structure/precipitation, microphysics
- Model improvements
- Real-time atmospheric stability indices (including under full cloud cover)
- Surface wind warnings, tropical storm detection

**Synergy**

- **Complements GEO IR sounders (cloud clearing)**
- **Complements LEO sounders (swath-gap & temporal-gap filling)**
- **Complements GEO imagers (resolution enhancement of AMV)**

**Dissecting hurricanes: 3D internal structure**