The sensitivity of hyperspectral IR sounders is shown to provide unique insight into tropical cyclones. The purpose of this study is to investigate the relationship between hurricane intensity and the temporal changes in cloud structure and water vapor distribution of the storm and its environment. The CIMSS Cloud Amount Vertical Profile (CAVP) and Dual Regression algorithms are used in this analysis of Hurricane/Super Typhoon Ioke at various points in its life cycle. Great potential exists for this type of analysis using the future geostationary hyperspectral sounders, e.g. MTG IRS or GMW STORM. This analysis uses AIRS L1B radiances from Aqua overpasses.

The path of Hurricane Ioke across the Central Pacific in October 2006 was intersected by overpasses of the NASA Aqua satellite with the MODIS and AIRS sensors. Several cases of varying storm intensity were selected along the track to investigate the relation of remotely sensed cloud geometry to intensity. The CAVP product was compared with CALIPSO passes to check for consistency in cloud top heights of rainbands, when possible.

**Results**

The path of Hurricane Ioke across the Central Pacific in October 2006 was intersected by overpasses of the NASA Aqua satellite with the MODIS and AIRS sensors. Several cases of varying storm intensity were selected along the track to investigate the relation of remotely sensed cloud geometry to intensity. The CAVP product was compared with CALIPSO passes to check for consistency in cloud top heights of rainbands, when possible.

**Case 1: Ioke 22 Aug 2006 0030Z 13.6°N, 192.8°W Cat. 4**

**Case 2: Ioke 25 Aug 2006 1312Z 19.4°N, 186.4°W Cat. 5**

**Case 3: Ioke 04 Sept 2006 0318Z 29.6°N, 149.2°W Cat. 1**

**Table 1: Ioke Latitude/Longitude/Date/Time/Intensity/RB Slope**

<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME</th>
<th>LAT</th>
<th>LON</th>
<th>CAT</th>
<th>RAINBAND SLOPE (m/km)</th>
<th>RAINBAND TYPE</th>
<th>INTENSITY VS. SLOPE R2</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 Aug 06</td>
<td>0030Z</td>
<td>13.6</td>
<td>192.9</td>
<td>4</td>
<td>-1.68</td>
<td>Secondary</td>
<td>0.98198</td>
</tr>
<tr>
<td>25 Aug 06</td>
<td>1312Z</td>
<td>19.4</td>
<td>186.4</td>
<td>5</td>
<td>-1.33</td>
<td>Distant</td>
<td>0.98198</td>
</tr>
<tr>
<td>28 Aug 06</td>
<td>1200Z</td>
<td>16.6</td>
<td>177.2</td>
<td>4</td>
<td>-1.62</td>
<td>Secondary</td>
<td>0.98198</td>
</tr>
<tr>
<td>04 Sep 06</td>
<td>0318Z</td>
<td>29.6</td>
<td>149.2</td>
<td>1</td>
<td>-1.18</td>
<td>Secondary</td>
<td>0.98198</td>
</tr>
</tbody>
</table>

**Conclusions**

- McIDAS-V was used to determine the slope of the cloud top along hurricane rainbands.
- The slope of the cloud top along the spiral arm of a secondary or distant rainband was found to have a characteristic value between -1 m/km and -2 m/km.
- The variation of this value with time is hypothesized to correlate with cyclone intensity. The distant rainband slope shows the best correlation in cases thus far.
- Measurements of distant rainbands using CAVP have less inherent error than measurements of primary and secondary rainbands (which occur closer to the eye).
- McIDAS-V has been used to integrate the CAVP and Dual Regression products.
- Application of these methods to tropical cyclones will be made during the 2012 Atlantic Hurricane season in support of the NASA Venture Class HS3 mission.

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