Bias and noise in IASI spectra may be identified by comparing the data with radiances calculated from forecasts and analyses from Numerical Weather Prediction (NWP) models. The bias and standard deviation of fit against model fields are compared for four operational centres: the Met Office, ECMWF, EUMETSAT and Météo-France/CMS. Good agreement is found between IASI and the NWP fields from all centres, showing that IASI is performing within its specification. Investigation of where the comparisons differ or agree can be used to infer whether errors arise from the NWP model, the spectroscopy or the instrument.

### 1. The case study for intercomparison

The data used for the intercomparison consist of 24 hours of IASI observations from 00:00 on 8th June to 00:00 on 9th June 2007. 314 Channels are shown.

Each centre processed the data with their operational system (see Section 2 for details), and selected only night-time observations over the sea which passed cloud detection tests.

The data are compared with NWP forecasts or analyses by the use of a fast radiative transfer model. Differences between IASI and NWP model are shown as brightness temperatures.

Because of differences in processing, the number of observations used by each centre are not the same:

<table>
<thead>
<tr>
<th>Met Office</th>
<th>ECMWF</th>
<th>EUMETSAT</th>
<th>Météo-France</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Obs</td>
<td>12757</td>
<td>81620</td>
<td>564</td>
</tr>
</tbody>
</table>

*Clear channels only – around 6800 obs for surface-viewing channels

### 2. Data Processing at the Four Centres

<table>
<thead>
<tr>
<th>Met Office Forecast</th>
<th>ECMWF Forecast</th>
<th>EUMETSAT</th>
<th>Météo-France</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid at observation time</td>
<td>Valid at observation time</td>
<td>ECMWF-6 hour Forecast from AVHRR L1b</td>
<td>ECMWF Analysis SST from AVHRR L1b</td>
</tr>
<tr>
<td>Fast Model</td>
<td>RTTOV 7</td>
<td>RTTOV 8</td>
<td>RTIASI</td>
</tr>
<tr>
<td>LBL model</td>
<td>kCARTA</td>
<td>kCARTA</td>
<td>GENLN2</td>
</tr>
<tr>
<td>Spectroscopy</td>
<td>kCARTA v24</td>
<td>kCARTA v24</td>
<td>HITRAN2000</td>
</tr>
</tbody>
</table>

### 3. Intercomparison of Biases

By comparing the standard deviation of Obs-Calc against how well we would expect to fit IASI taking into account NWP errors, instrument noise and forward model error, the fit of NWP model to IASI is as good as we would expect.

A comparison of IASI against AIRS (processed in a very similar way) shows that, as expected from the instrument noise profile, the IASI fit is better in the 15µm CO2 band and very similar in the H2O band (it is not possible to compare the same wavelengths and especially for the H2O band, differences in fit may result from the differing sensitivities of the exact channel selection).

### 4. Intercomparison of Standard Deviation

IASI fit to operational NWP models are consistent between centres and differences can be explained by variations in data selection techniques, cloud detection methodology and radiative transfer models.

The intercomparison experiment can highlight opportunities for improving data processing.

The fit of IASI is as good as expected prior to launch taking into account pre-launch estimates of noise, model errors and radiative transfer errors.

IASI compares favourably to AIRS, showing lower SD(Obs-Calc) in the 15µm CO2 band.

### 5 Met Office IASI fit compared to pre-launch expectation

By comparing the standard deviation of Obs-Calc against how well we would expect to fit IASI taking into account NWP errors, instrument noise and forward model error, it is shown that the fit of NWP model to IASI is as good as we would expect.

A comparison of IASI against AIRS (processed in a very similar way) shows that, as expected from the instrument noise profile, the IASI fit is better in the 15µm CO2 band and very similar in the H2O band (it is not possible to compare the same wavelengths and especially for the H2O band, differences in fit may result from the differing sensitivities of the exact channel selection).

### 6. Conclusions

IASI fit to operational NWP models are consistent between centres and differences can be explained by variations in data selection techniques, cloud detection methodology and radiative transfer models.

The intercomparison experiment can highlight opportunities for improving data processing.

The fit of IASI is as good as expected prior to launch taking into account pre-launch estimates of noise, model errors and radiative transfer errors.

IASI compares favourably to AIRS, showing lower SD(Obs-Calc) in the 15µm CO2 band.

### References

[3] Zhonghua Cheng et al., 2006 The use of principal component analysis in processing simulated IASI data. Proceedings of ITSC-XV, Maratea, Italy, 4-10 October 2006