The Bureau's Satellite Network

[Map of Australia showing ground stations and satellite network locations]
Direct Broadcast Network DB-Net

Critical for NWP

BoM data contribution to DBNet:

• ATOVS

• S-NPP and NOAA-20 ATMS and CrIS data from Crib Point and Learmonth by end of 2019
NWP at BoM

Australian Parallel Suite NWP Systems

ACCESS-G3 (12 km) and GE3 (36 km)

ACCESS-TC3 (4 km)

ACCESS-C3 (1.5 km) and CE3 (2.2 km)
### Data Assimilation

<table>
<thead>
<tr>
<th>Platform</th>
<th>Instruments/Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOAA-15, NOAA-18</td>
<td>AMSU-A</td>
</tr>
<tr>
<td>NOAA-19</td>
<td>AMSU-A, MHS</td>
</tr>
<tr>
<td>GCOM-W1</td>
<td>AMSR-2</td>
</tr>
<tr>
<td>MetOp-A, Metop-B</td>
<td>IASI, AMSU-A, MHS, ASCAT, GNSS-RO</td>
</tr>
<tr>
<td>MetOp-C</td>
<td>GNSS-RO</td>
</tr>
<tr>
<td>DMSP-17</td>
<td>SSMIS</td>
</tr>
<tr>
<td>Terra</td>
<td>AIRS, AMV</td>
</tr>
<tr>
<td>GOES-15, GOES-16,</td>
<td>AMV</td>
</tr>
<tr>
<td>Meteosat-8,</td>
<td></td>
</tr>
<tr>
<td>Meteosat-11</td>
<td></td>
</tr>
<tr>
<td>FY3-C, TerraSAR-X,</td>
<td>GNSS-RO</td>
</tr>
<tr>
<td>COSMIC2</td>
<td></td>
</tr>
<tr>
<td>NOAA-20</td>
<td>CrIS (FSR/NSR) + ATMS</td>
</tr>
<tr>
<td>Suomi-NPP</td>
<td>CrIS + ATMS</td>
</tr>
<tr>
<td>Himawari-8</td>
<td>CSR, AMV</td>
</tr>
<tr>
<td>SARAL, Jason-2/3</td>
<td>Altimeter wave/winds, sea surface heights</td>
</tr>
</tbody>
</table>

- NOAA-20 ATMS and CrIS
- ScatSat-1
- Metop-C GRAS
- Preparation for Metop-C AMSU/MHS and IASI

> 20 satellites and instruments
Numerical Weather Prediction in Australia

Criticality of Satellites for NWP Forecast Skill

(Le Marshall et al. 2013, AMOJ)
Impact of Observations on NWP Forecast Skill

FSOI for each of the major observing instruments/types in ACCESS-G for January to June 2019 (negative values indicate the reduction in forecast error associated with the observation type).
Satellite Products: Operational

- Forecaster Imagery
- Satellite data for NWP/Oceans
- Sea Surface Temperature
- Solar Radiation
- Grassland Curing Indices
- Vegetation Indices
- Cloud Properties
- Convective Rainfall Rate
Solar Radiation

- Gridded surface solar data over Australia from 1990 to NRT
- Internal uses
  - National water assessments (AWRA)
  - Land surface model (JASMIN)
  - Evaporation
- External uses
  - Solar energy industry and research
  - Australian Renewable Energy Mapping Infrastructure (AREMI)
  - Agriculture
  - Nationwide House Energy Rating Scheme
Atmospheric Motion Vectors for NWP

Operational generation and assimilation of continuous (10 min) local Himawari-8 using GEOCAT and 4DVAR

(Le Marshall et al. JSHESS 2017)

H-8 AMVs around TC Quang 00UTC 29 April 2015

The RMS difference between forecast and verifying analysis geopotential height (m) at 24 hours for ACCESS-R with (green) and without (red) hourly AMVs

AMVs reduce errors
Satellite Products: Operational

Improves moisture analysis and forecasting

Effective assimilation of ZTD data into the ACCESS model

(Le Marshall et al. JSHESS 2019)

Now operational, assimilating ZTD into next generation Capital City and Global ACCESS Models

Using Ground GPS/ZTD in NWP

Partnership between
Bureau of Meteorology
RMIT University
Geoscience Australia

ZTD Data Impact by Grid Scale
Satellite Products: Under Development

- Blended precipitation combining NWP, radar, Himawari (+delayed Microwave/GPM)
- Improved storm cell tracking (collaboration with EUMETSAT)
- Emergency services and air quality
- Fire detection & fire front tracking
- Coastal / high resolution Sea Surface Temperature
- Aviation products: Fog detection & dissipation; High Ice Water Content
Satellite Products: Under Development

Fire Temperature Enhancement

Himawari-8: 2019-03-02

Sharing Data - National Environmental Information Infrastructure

The NEII platform provides easy access to a broad range of Web Data Services from several Australian Government Agencies.

These Web Data Services include satellite data such as:
- Water Observations from Space (WofS)
- Weathering Intensity
- Vegetation and Soil cover and Surface Reflectance data
Thank you