The Bureau of Meteorology

Satellite Surface Solar Irradiance

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Thanks to Japan for Himawari

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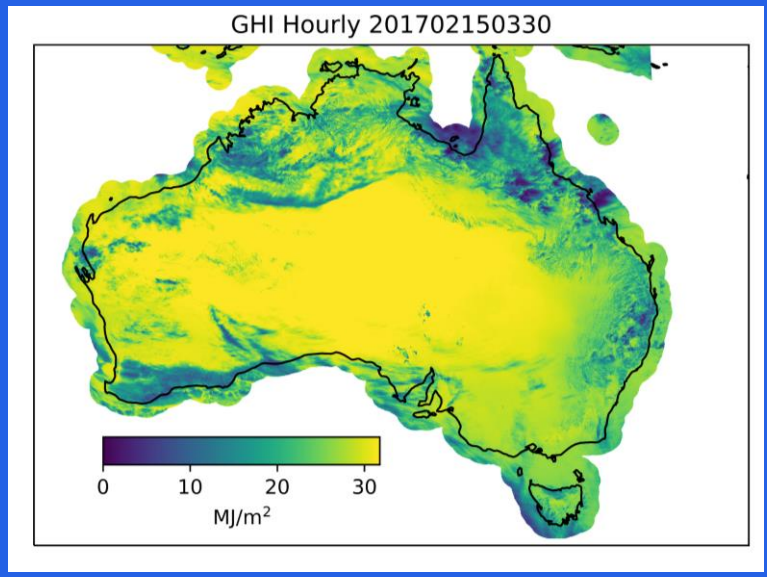
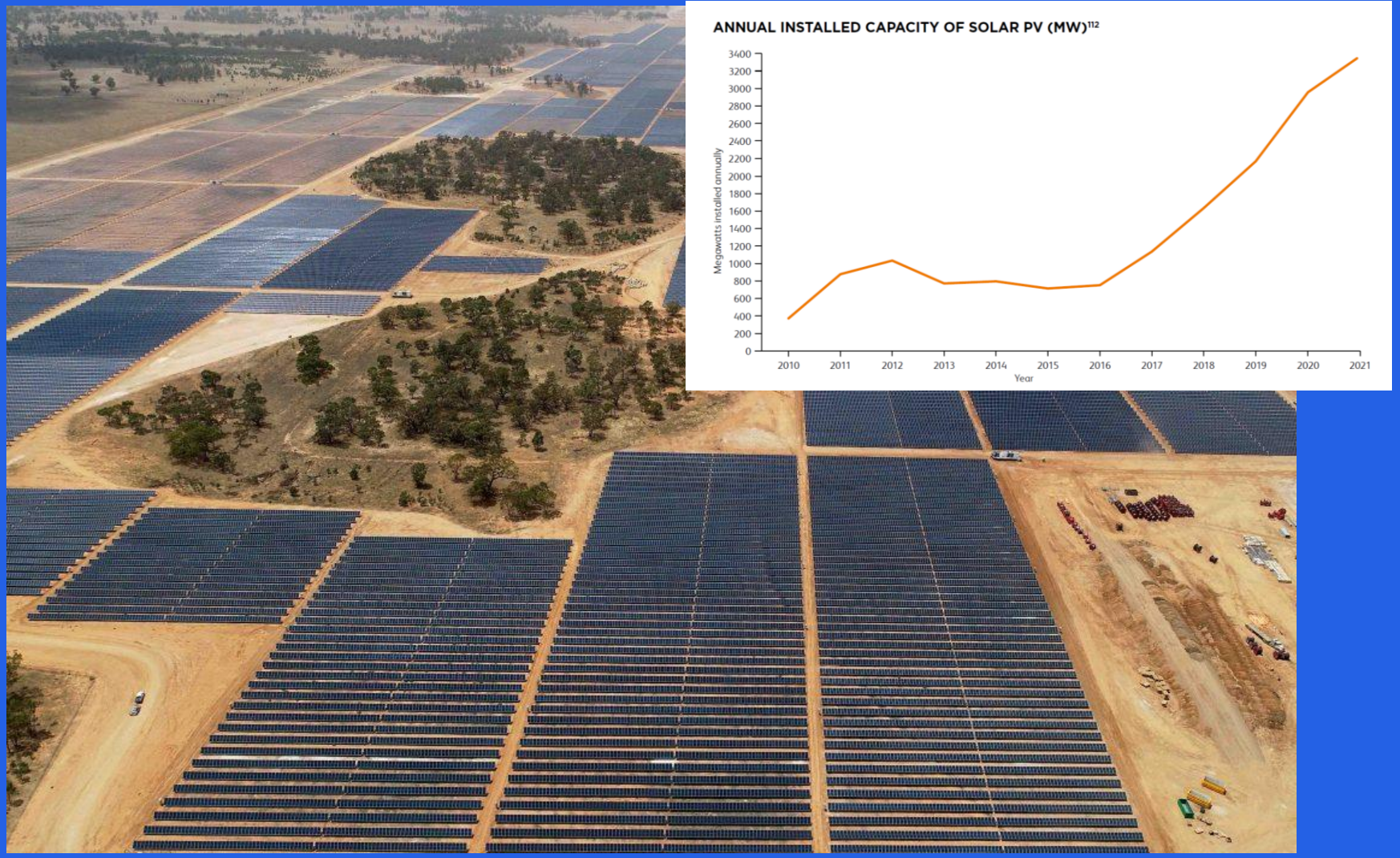


Solar irradiance applications

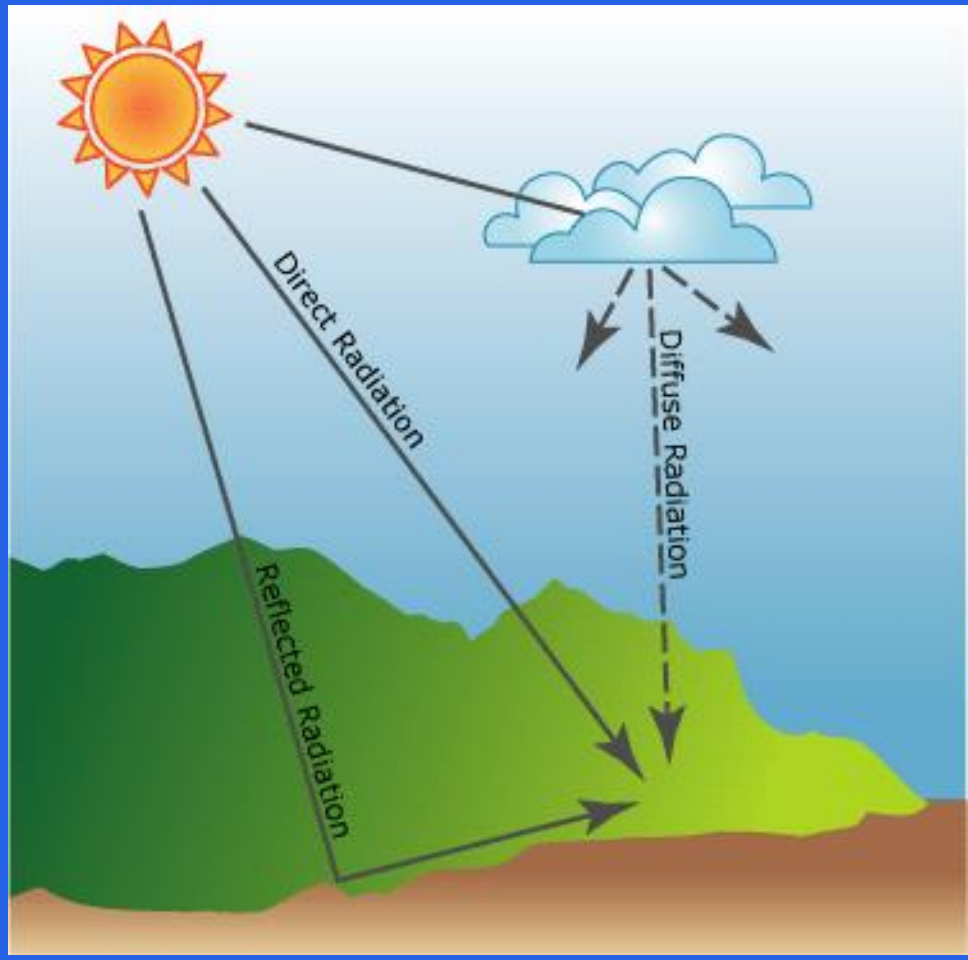


The acronyms!

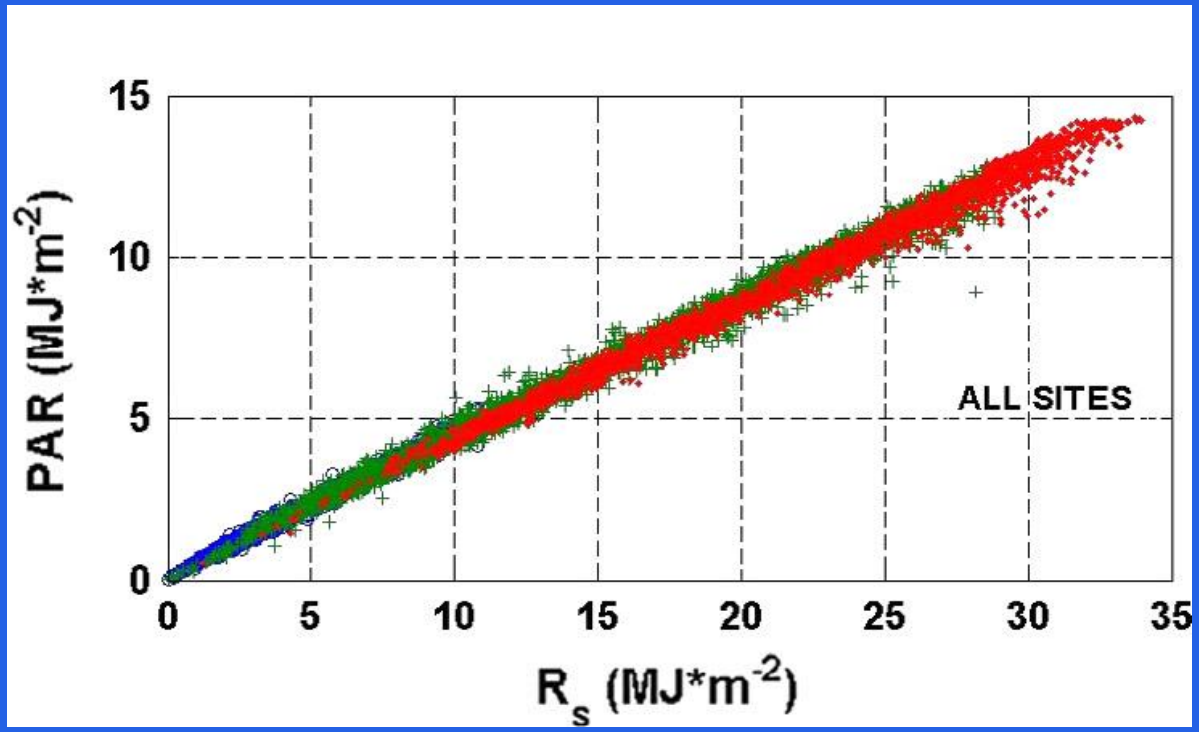
SSI (~0.3–4.0 µm) Surface solar irradiance

GHI Global Horizontal Irradiance
DNI Direct Normal Irradiance
DHI Diffuse Horizontal Irradiance
Units W/m^2

GHI = DNI X cos(θ) + DHI



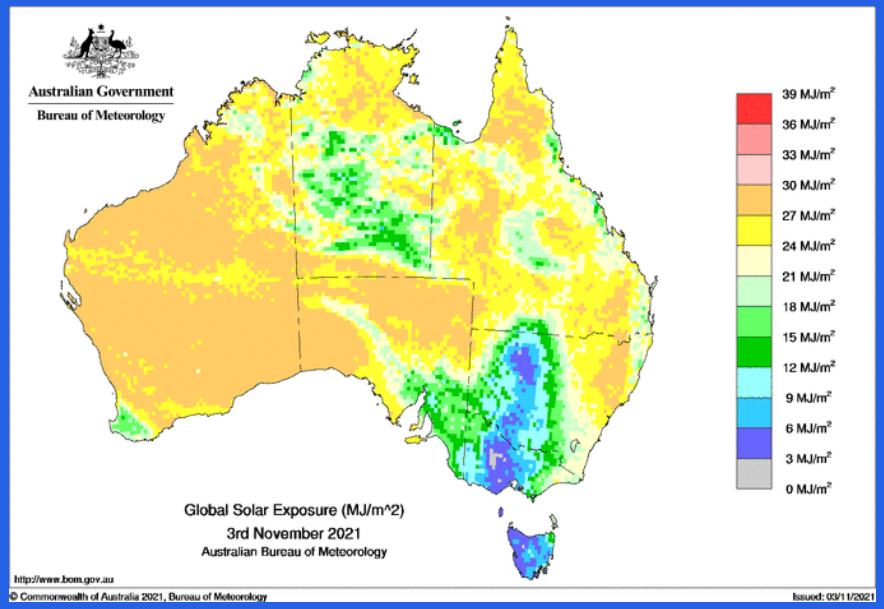
Photosynthetic Active Radiation (PAR) 400-700nm



https://doi.org/10.1016/j.enconman.2014.09.038

What's new ?

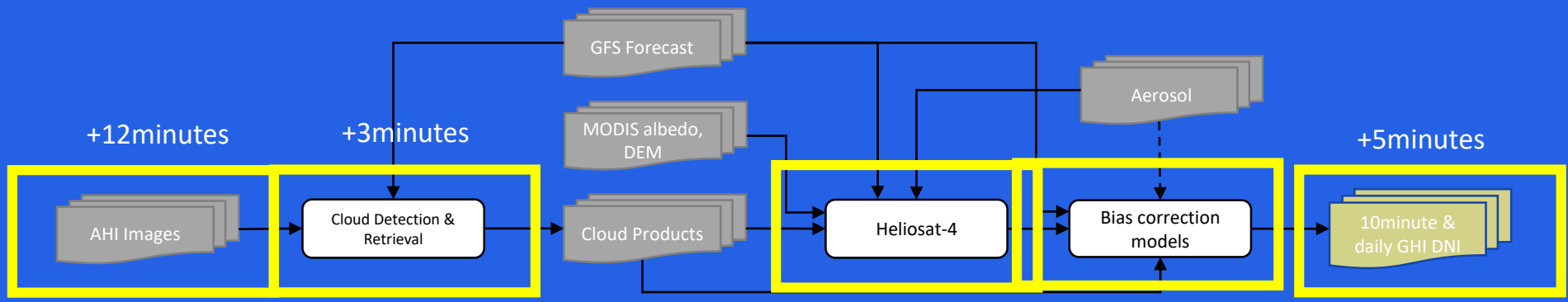
- Bureau has been producing satellite solar products since 1991 (Weymouth and Le Marshall)
- Existing products produced for each hour and 5km resolution
- **Whats new?**
  - **Himawari satellite** now every 10 minutes and 2km resolution
  - New developments in the solar modelling community
  - BoM has new cloud retrieving capability
  - Extend over sea

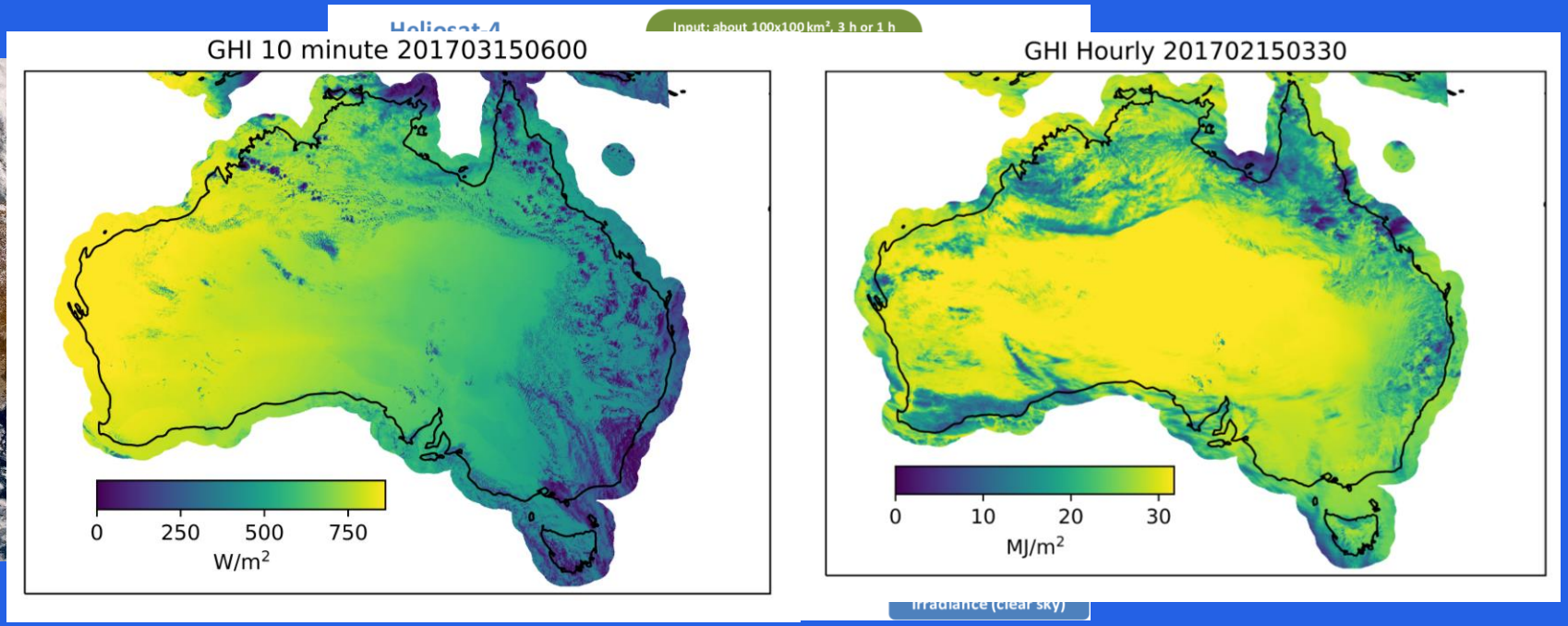


Ground-based solar observations

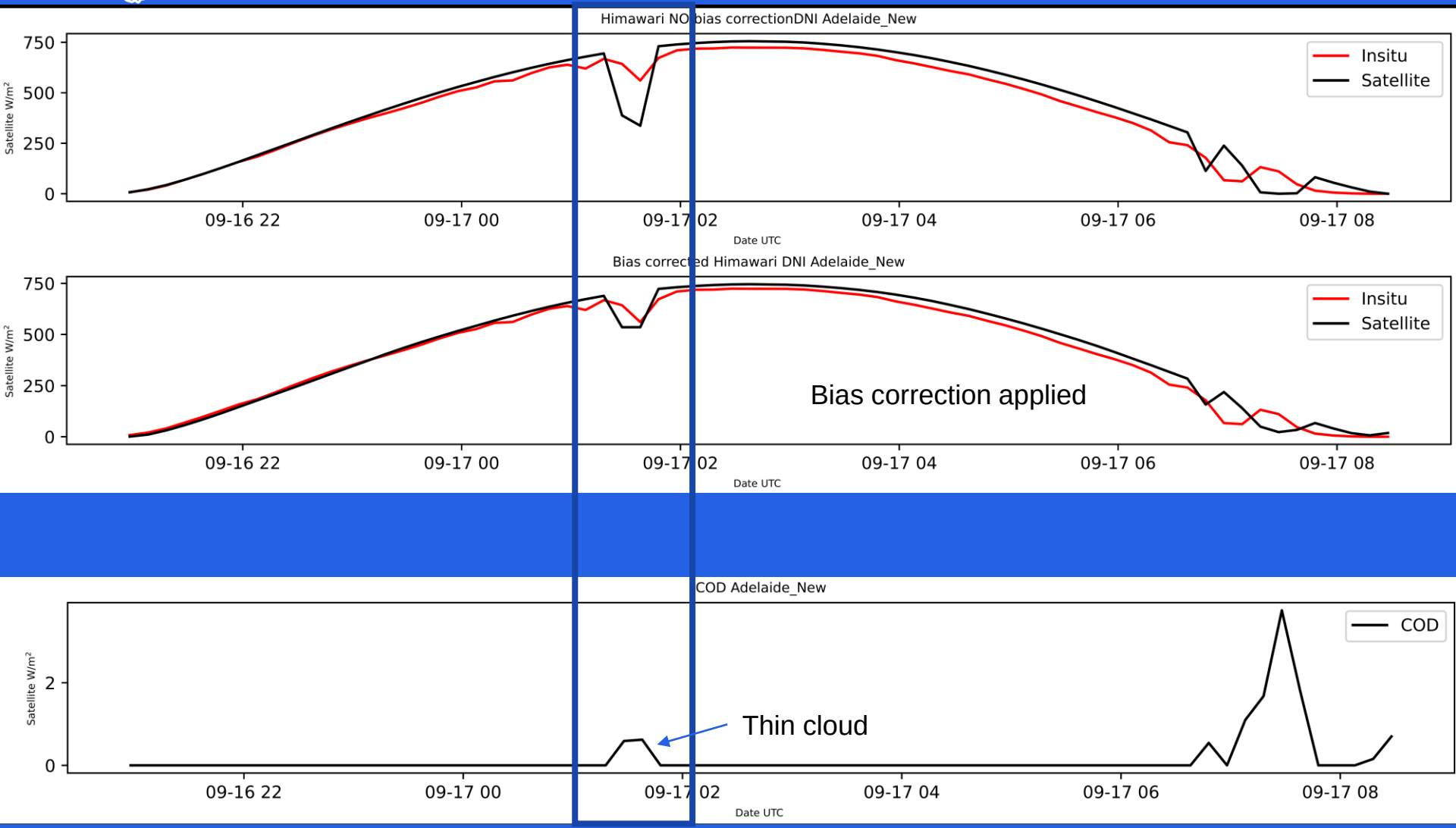
13 open sites

→Key for validating the results
→Key to developing bias correction


GFS Forecast
Aerosol
+12minutes
+3minutes
MODIS albedo, DEM
+5minutes
AHI Images
Cloud Detection & Retrieval
Cloud Products
Heliosat-4
Bias correction models
10minute & daily GHI DNI

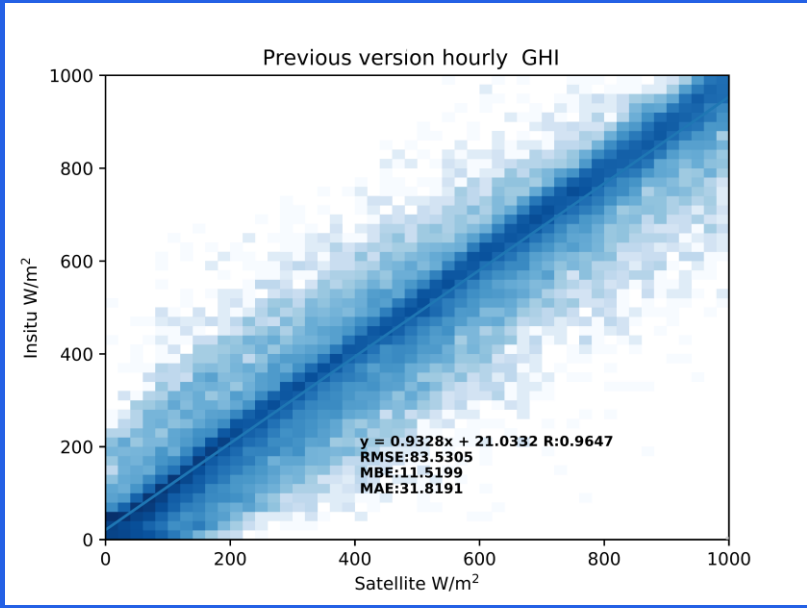

GHI 10 minute 201703150600
0
250
500
750
W/m2
GHI Hourly 201702150330
0
10
20
30
MJ/m2

Daily with and without bias correction

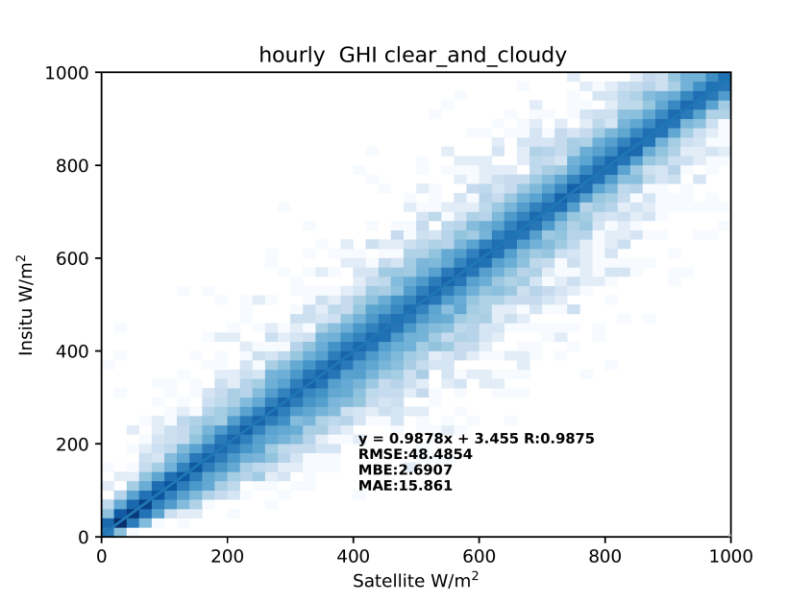


Improvement!

Old

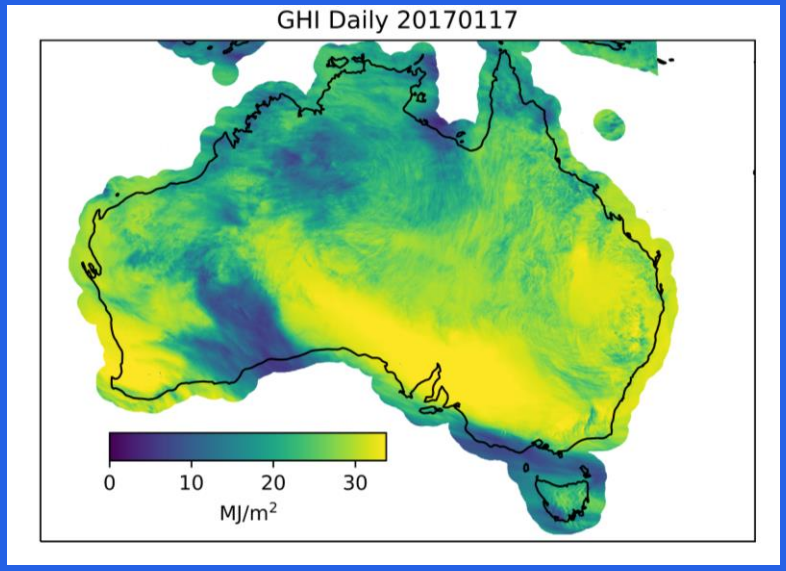


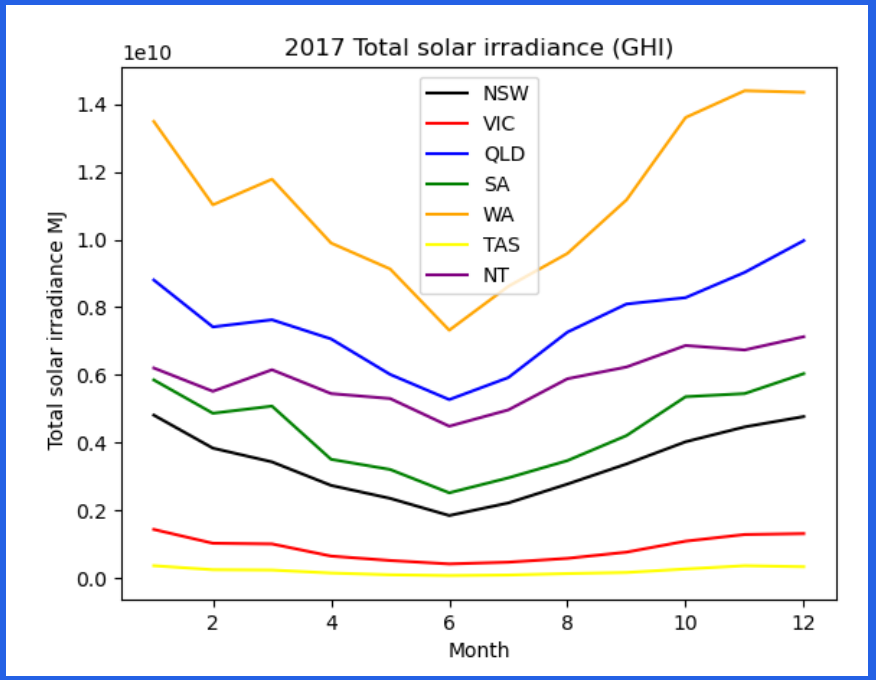
New solar



MAE= Median absolute error
MBE =Mean Bias error

Daily average GHI by state for 2017

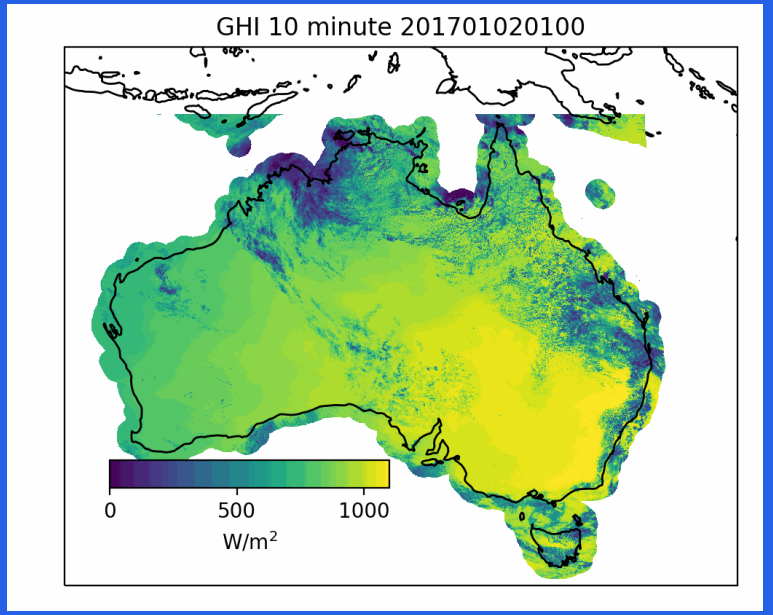




Summary: Solar Irradiance Products

Bureau has updated its **Near Real Time Surface Solar Irradiance service**

- Applications, solar industry, agriculture and climate.
- 10 minute 2km resolution Global Horizontal irradiance (GHI) and Direct normal Irradiance (DNI)
- Standard HelioSat-4 products bias corrected using machine learning
- http://www.bom.gov.au/research/publications/researchreports/BRR-062.pdf
- Identified a number of areas we can improve
  - Aerosol information
- **New project Forecasting Capability being investigated** watch this space!



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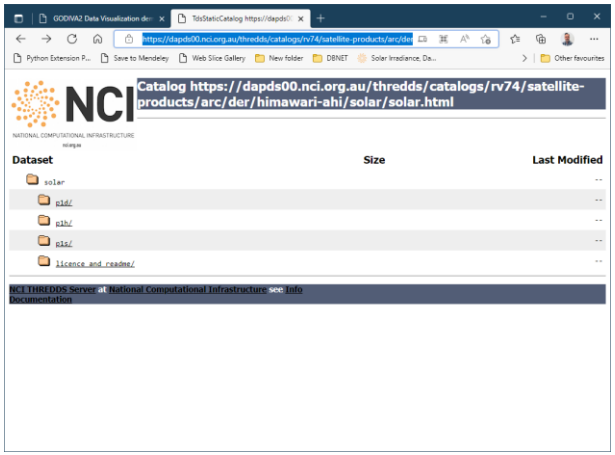
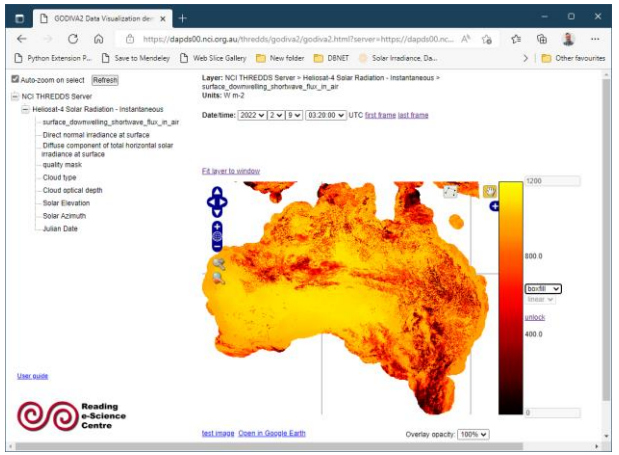
Gridded Solar Observations

- Data is available to researchers
  - CC-BY-NC-4.0 license
  - 3 month delay vs operational / commercial access





https://dapds00.nci.org.au/thredds/catalogs/rv74/satellite-products/arc/der/himawari-ahi/solar/solar.html