Generating Australian historical weather data files to facilitate solar generation simulations

Ben Elliston

School of Electrical Engineering & Telecom.
University of New South Wales
Sydney, Australia

Outline

- Motivation
- Overview of weather data file formats
- Weather data sources
- Weather file utility
- Example of use: 2009 dust storm
- Conclusions & further work

Background & motivation

- TMYs not always suitable
- Growing use of weather data files
  - SAM, TRNSYS, EnergyPlus, FirstRate
  - Typically use TMYs
- High quality TMYs for Australia limited
- BoM has excellent records & solar data
- Needed a utility to convert BoM data into AMYs

Weather data file formats

- Numerous formats: TMY, TMY2, TMY3, EPW
- TMY formats can be used for AMYs
- TMY3 and EPW:
  - human readable, comma separated formats
  - header followed by records
  - defines “missing data” special values

Weather data sources

- Obtain most variables from BoM AWS
- Station details supplied by BoM
  - Latitude, longitude, elevation of station
- Gridded solar data product used for GHI, DNI
  - 5km x 5km resolution
  - Grid selected from station location
  - Derive DHI from GHI, DNI
- Nice if hourly AWS data were available from *Climate Data Online* web site

Weather variables required by SAM

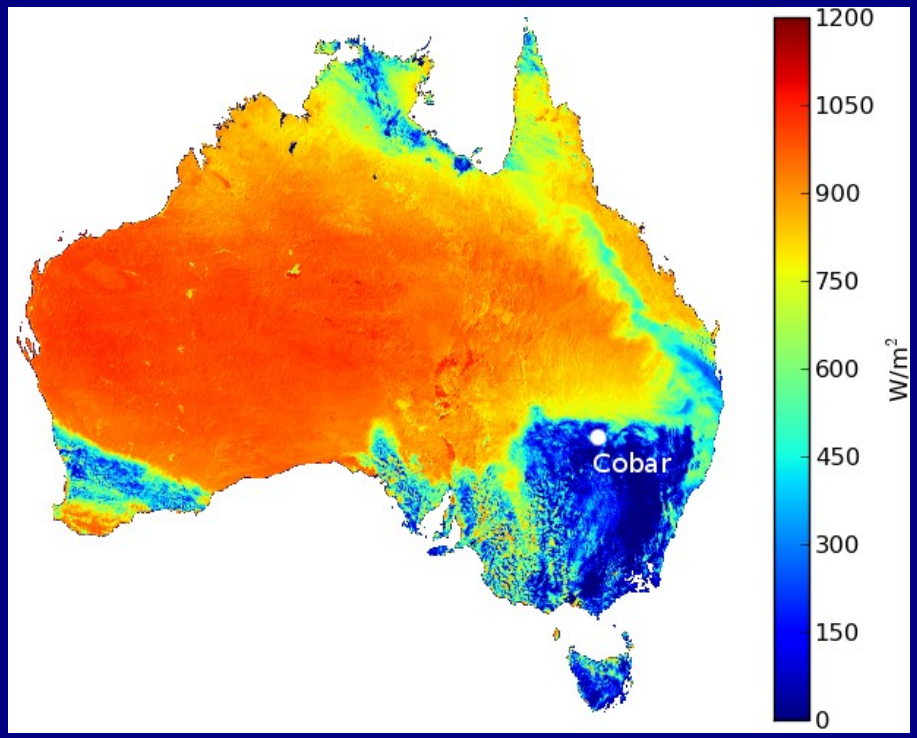
Dry bulb temperature	Wind velocity	Site latitude
Dew point temperature	Wind direction	Site longitude
Wet bulb temperature	Atmospheric pressure	Site elevation
Relative humidity	Global horizontal irradiation	Diffuse horizontal irradiation
Date and hour	Direct normal irradiation	

Weather file utility

- Command line utility
- Written in Python
- Supports multiple “back ends”: TMY3, EPW
- User specifies:
  - Output filename
  - Year of interest
  - Filename of BoM AWS station details file
  - Filename of BoM AWS data file
  - Desired format (optional, default is EPW)

Example of use: 2009 dust storm

- Extreme events not captured in TMYs
- May have severe impact on RElec generation
- Consider 100MW trough plant in Cobar, NSW



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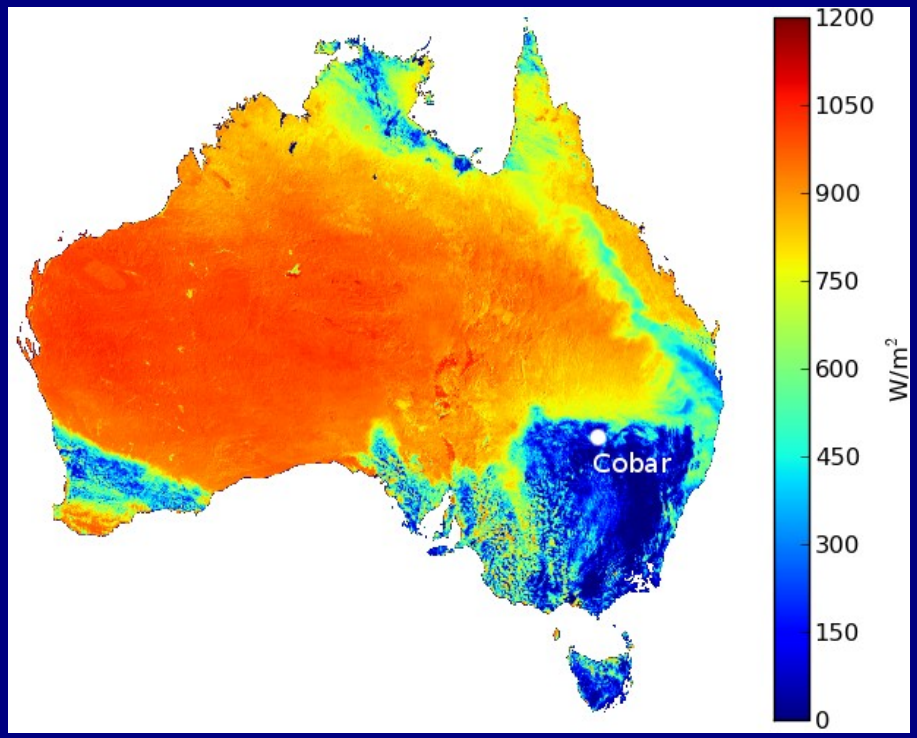

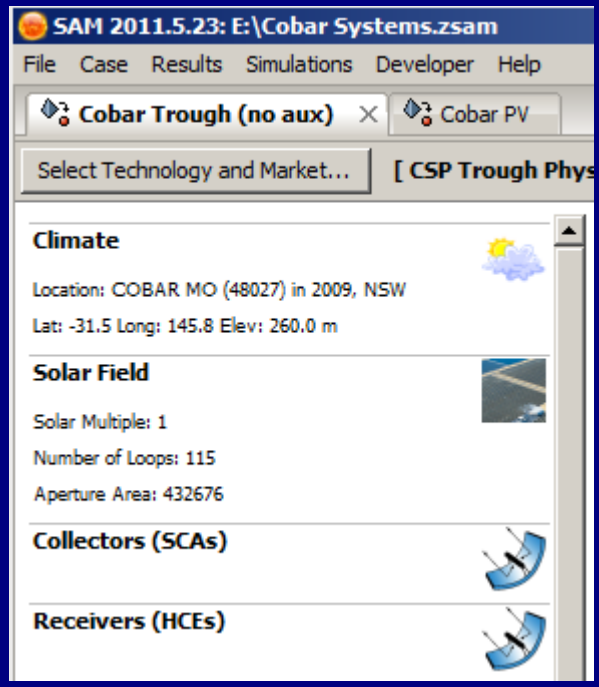

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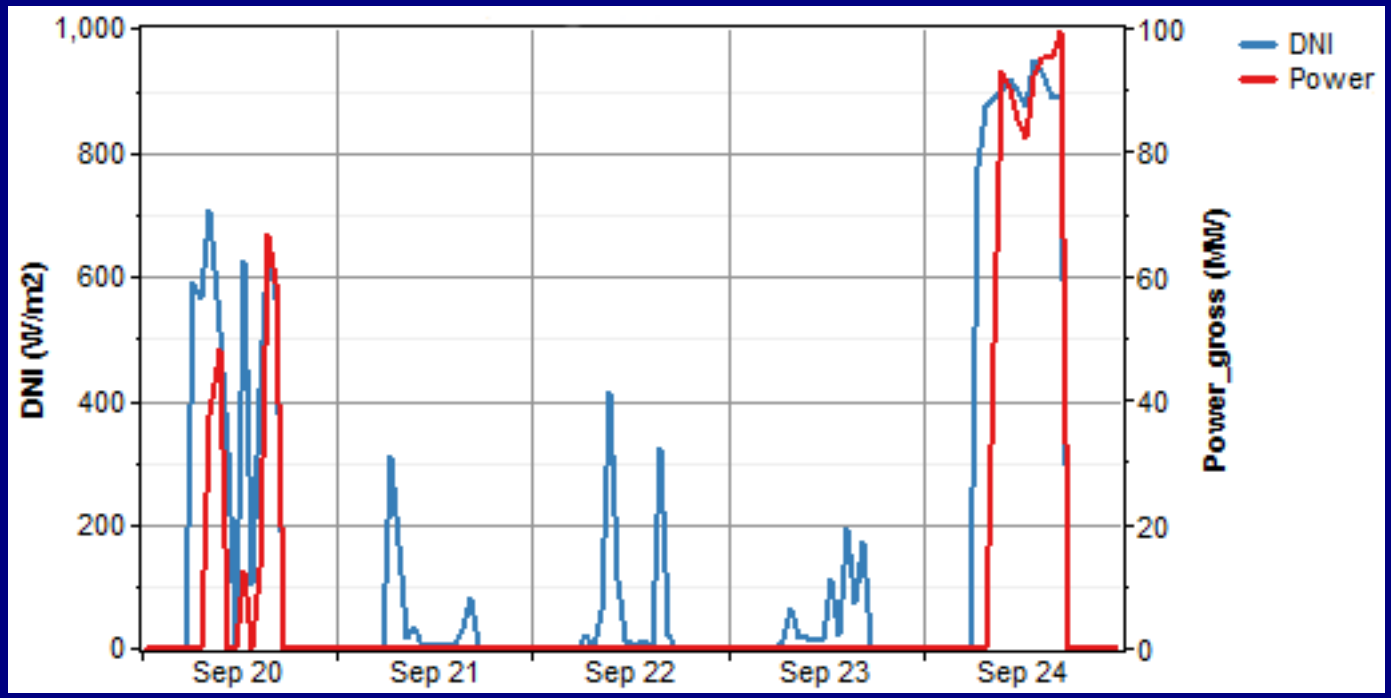
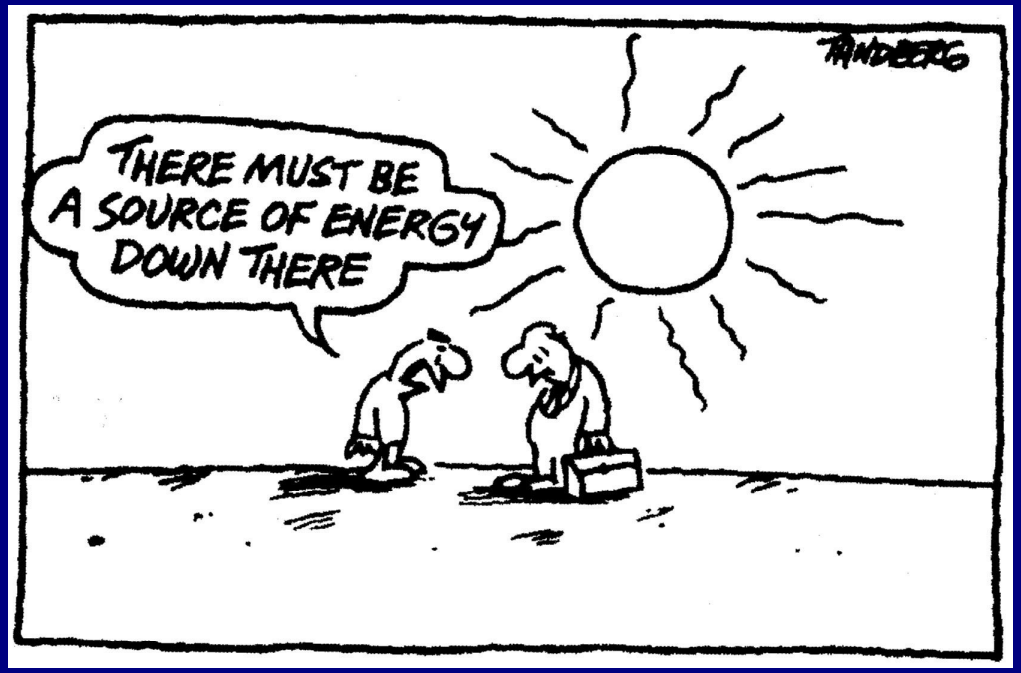


Simulated 100MW trough plant in Cobar, NSW, September 2009

Conclusions

- Valuable for evaluation in less common conditions
  - Dust storms, cyclones, heat waves, cold snaps
  - Comparison with other time series
- Under on-going development
- BoM data availability could streamline the process
- Further work
  - Include more weather variables
  - Handle leap years correctly
  - Quantify error due to sources not being synchronised
  - Compare simulated plants with actual performance

Questions?



Ben Elliston
b.elliston@student.unsw.edu.au

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