

METEOROLOGICAL DATA PROCESSOR
FOR AERMOD
BRIEFING OF GUIDELINES “CONSTRUCTION OF INPUT
METEOROLOGICAL DATA FILES FOR REGULATORY AIR MODEL
(AERMOD) OF EPA, VICTORIA”

Common question !

AERMET is the US EPA's
standard met processor
for AERMOD

Why can't
we use it ?

AERMOD Contd...

US AERMET

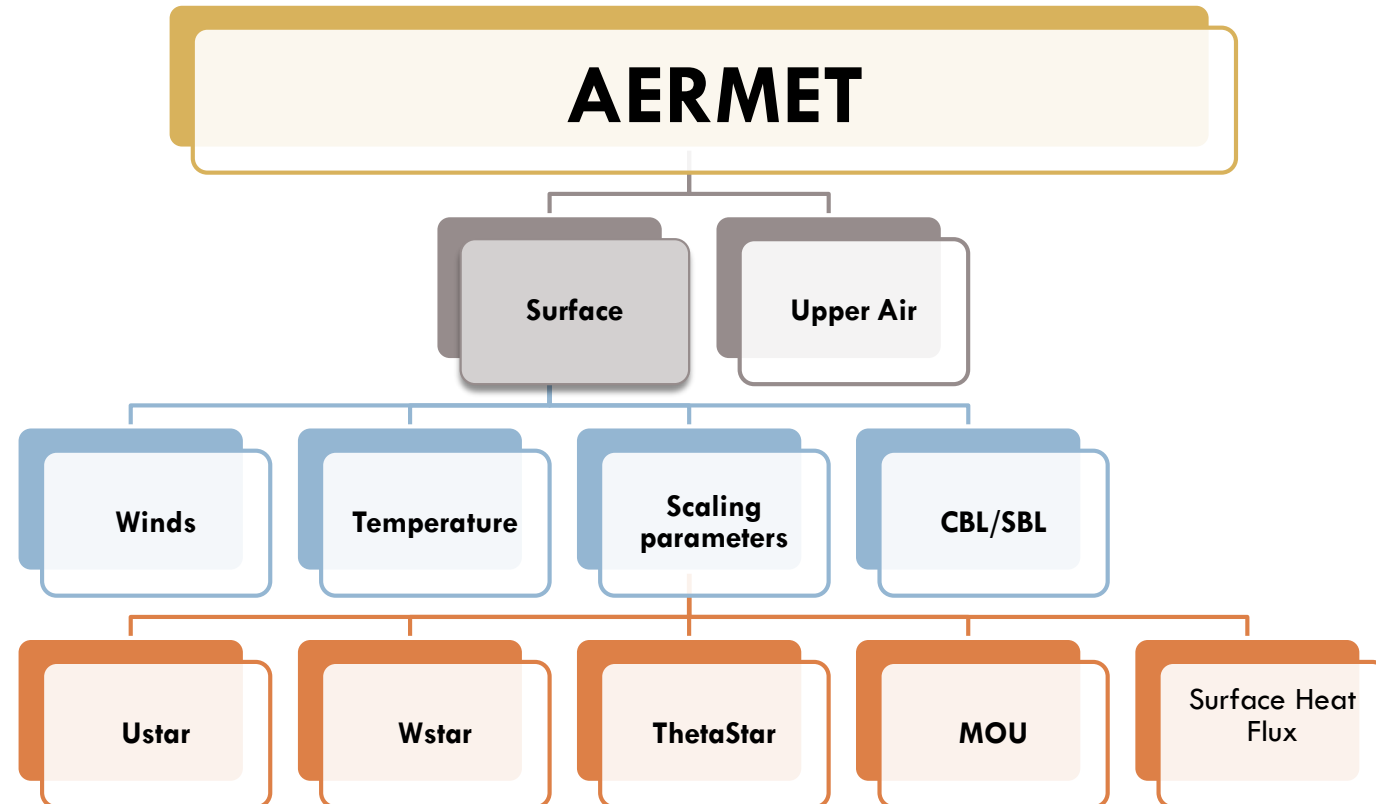
Consists of

- **AERMOD Meteorological Pre-processor (AERMET)**
- Characterises
 - state of surface and mixed layer
 - Vertical structure of the PBL (Planetary Boundary Layer)
 - Convective, Stable
 - Two input metfiles
 - more details later...

AERMOD continued.



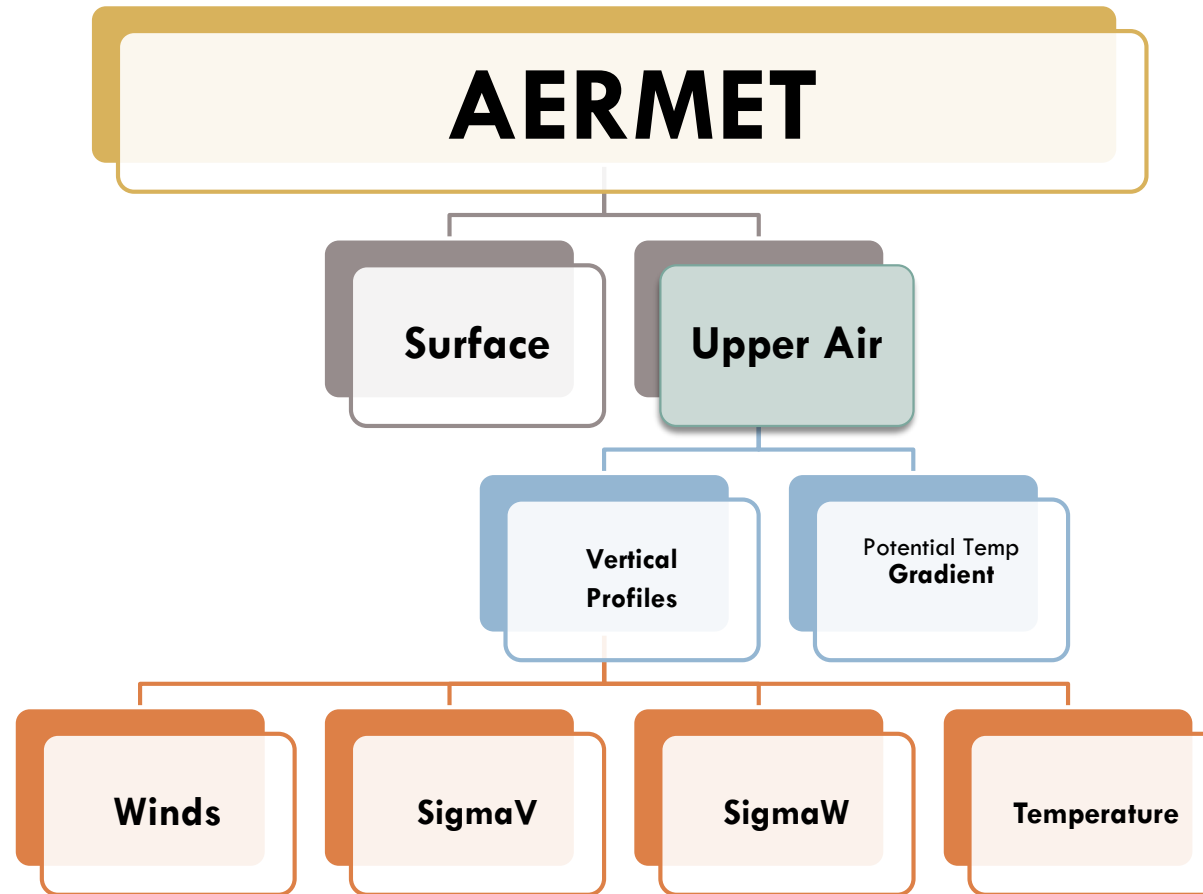
System Structure



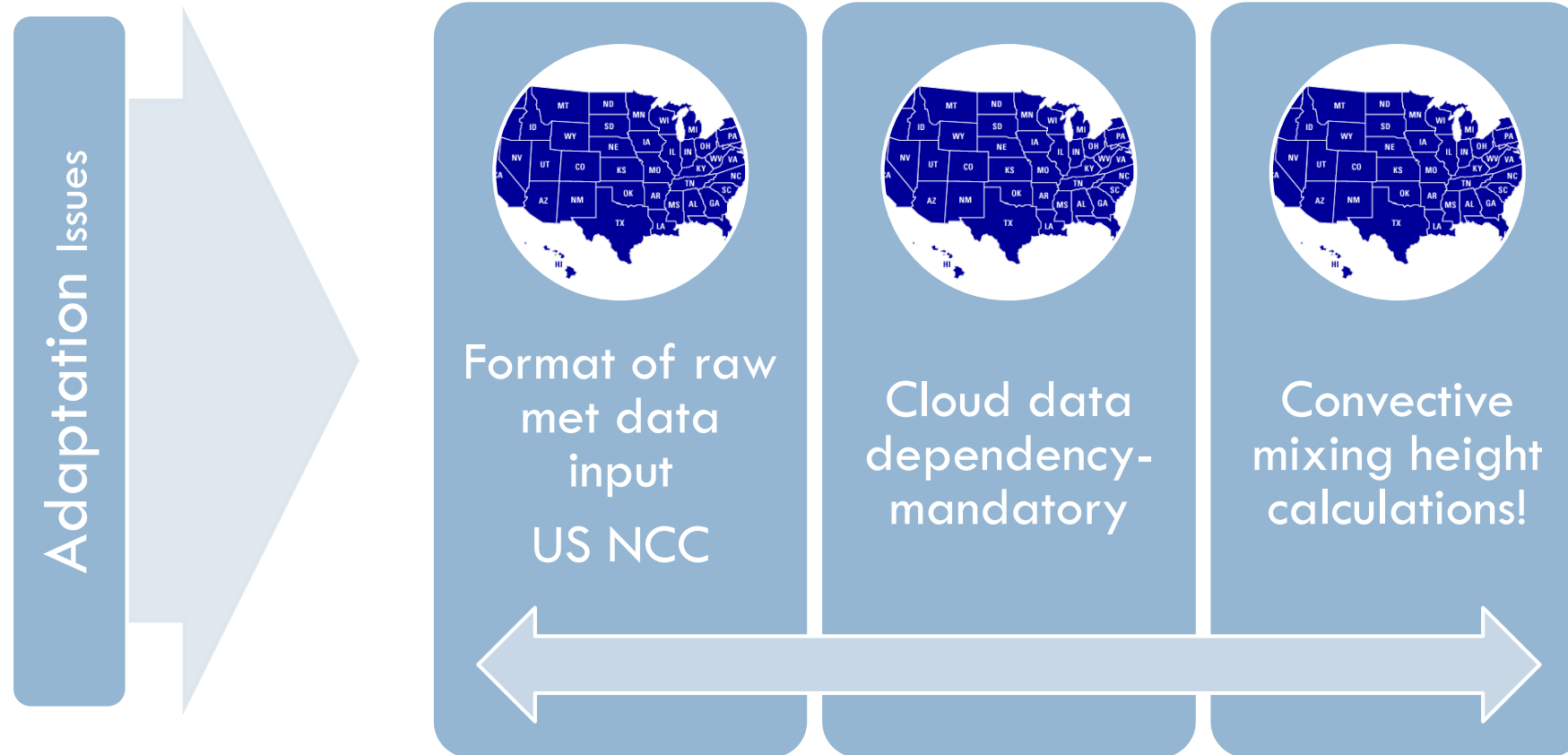
AERMOD continued.



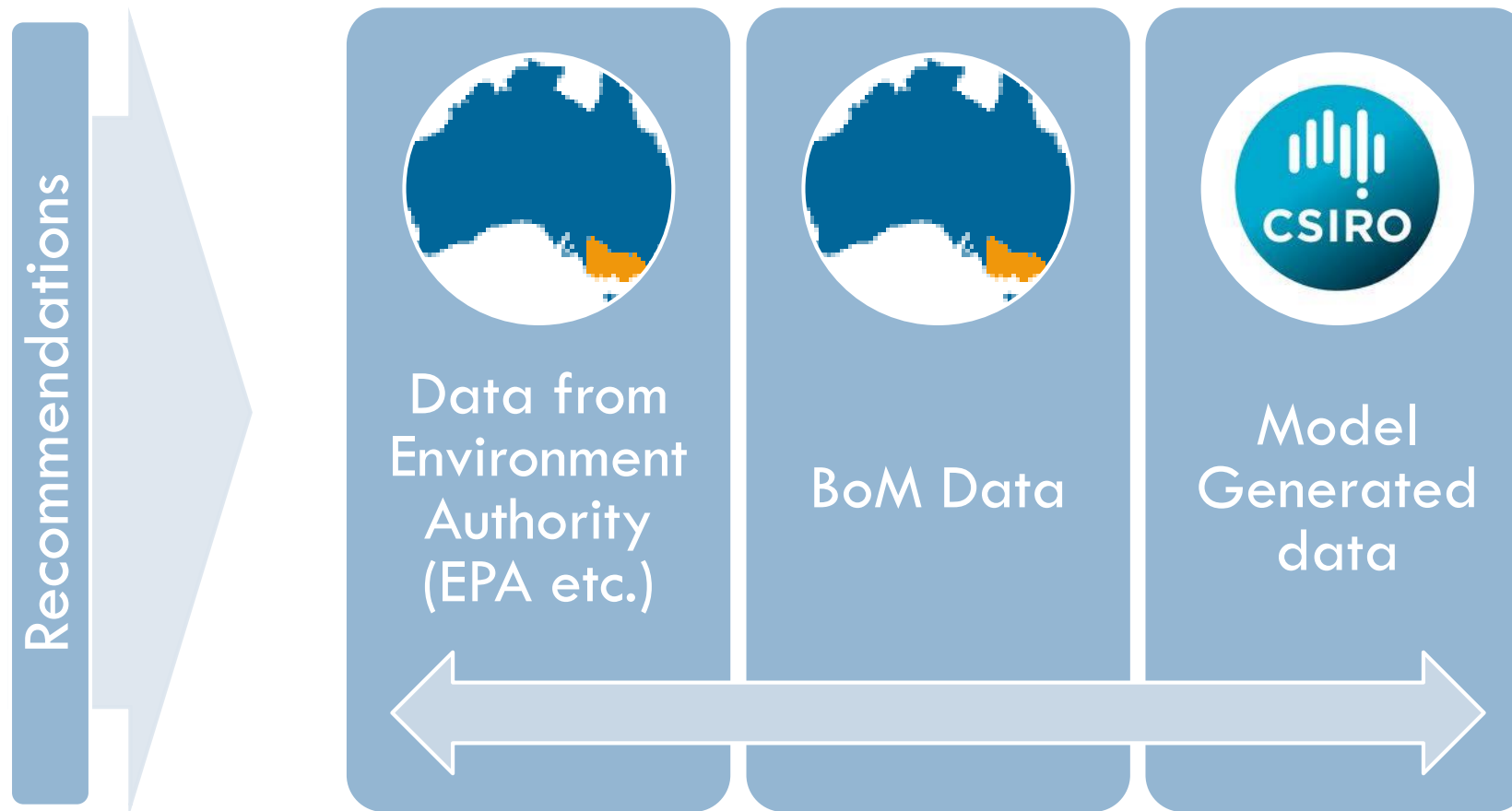
System
Structure



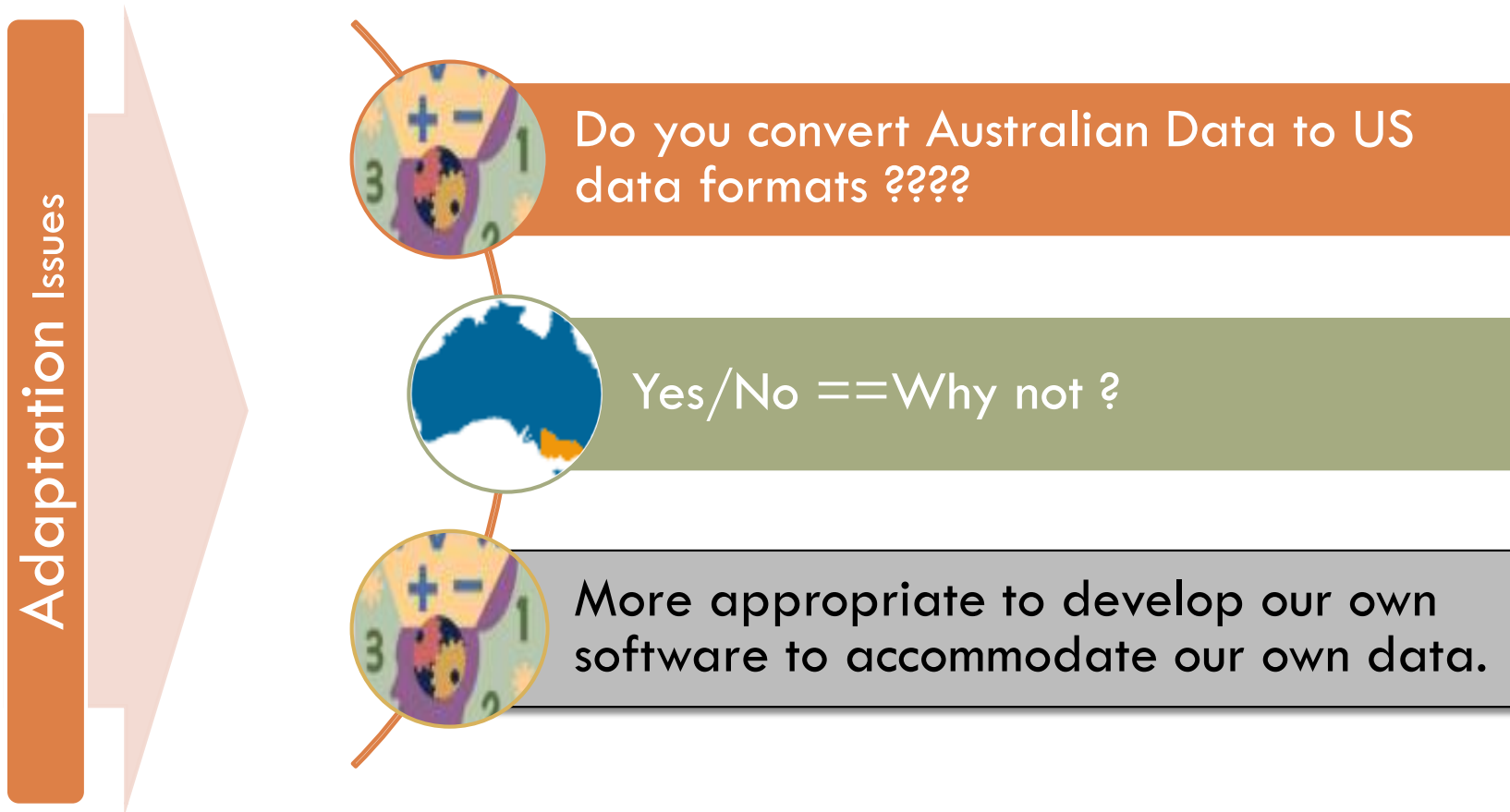
AERMET –Std Met Processor for AERMOD-input data



Input Meteorology –Surface (Local data sources)



Input Meteorology -Surface



Input Meteorology -Surface

Adaptation Issues

Sensible Heat flux (SH) is very important Parameter

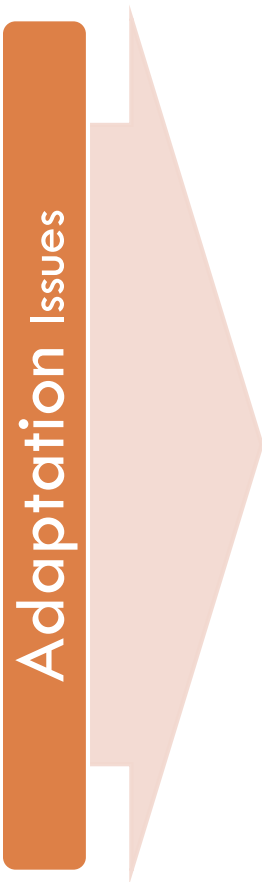
Depends on Net Radiation

Net Radiation calculations depend on Total Solar Radiation(TSR)

Australian formula for
TSR should be used

U^* and L depend on
SH

Input Meteorology -Surface



Direct use of measured Net Radiation should be used when available

Should be able to use TAPM generated Net Radiation when there are no cloud data

Local Algorithms are required

Input Meteorology -Surface

Adaptation Issues

Determination of soil wetness is required

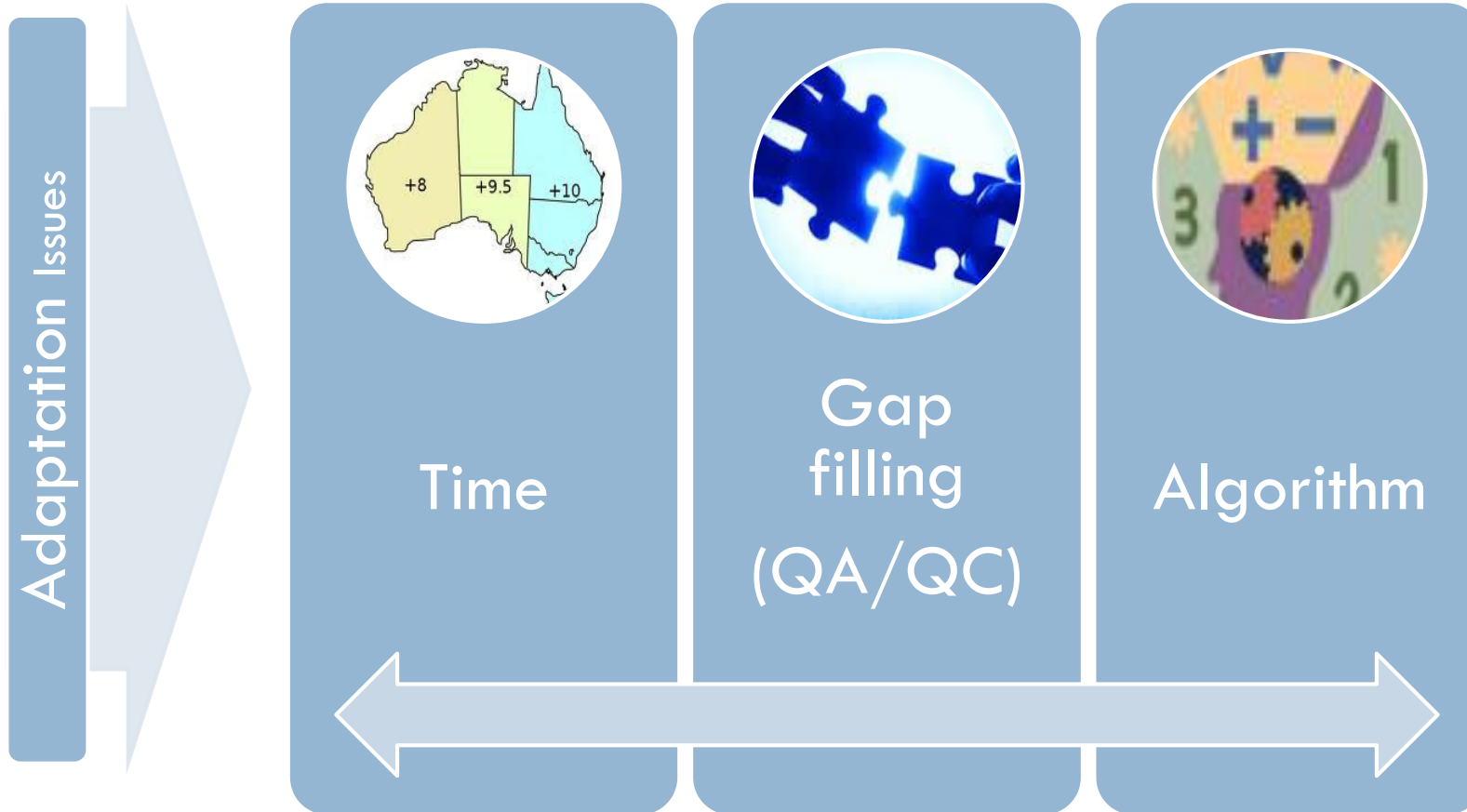
It is recommended to use rainy days rather than rainfall

**Daily Rain
fall > 1 mm
as rainy day**

Local Algorithms and a technique
are required

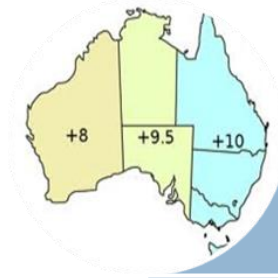
Required to select correct Bowen Ratio

Input Meteorology –Upper Air (Radiosonde)



Input Meteorology –Upper Air (Radiosonde)

Adaptation Issues

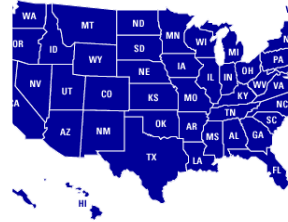


Time of
Radiosonde

- 00Z, 12 Z (GMT)
- 10 AM and 10 PM in Melbourne
- Most stable sounding close to sunrise is required for AERMET

Input Meteorology –Upper Air (Radiosonde)

Adaptation Issues



Format of
Radiosonde Data

- US Std formats are required for AERMET
- Real time data avb in FSL format
 - Issues
 - QA/QC, gaps ,resolution
 - Not avb in this format from NCC, BoM but available in generic format
 - All levels or mandatory and signifiabile levels should be used-all levels available from BoM

Input Meteorology –Upper Air (Radiosonde)

Adaptation Issues

Algorithm

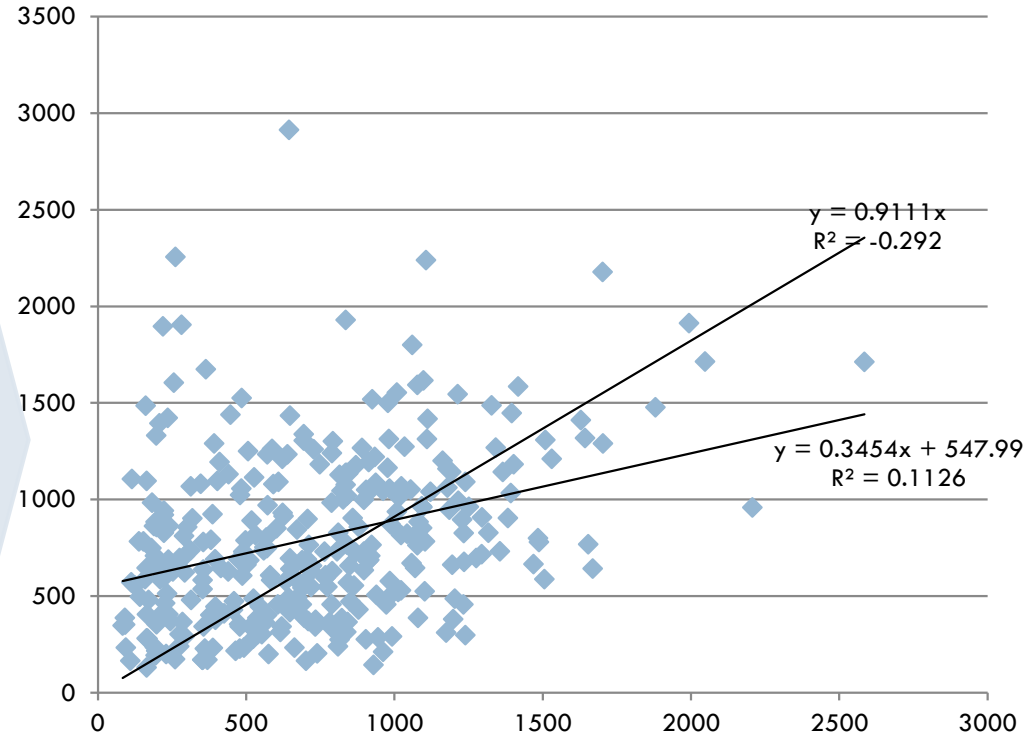


- Dry adiabatic assumption ?
- Cloud info. Dependency
 - In US mtd.
- Hourly **Temperature** and Moisture dependency is more desirable.

Performance (MixH Calculations)

Comparison

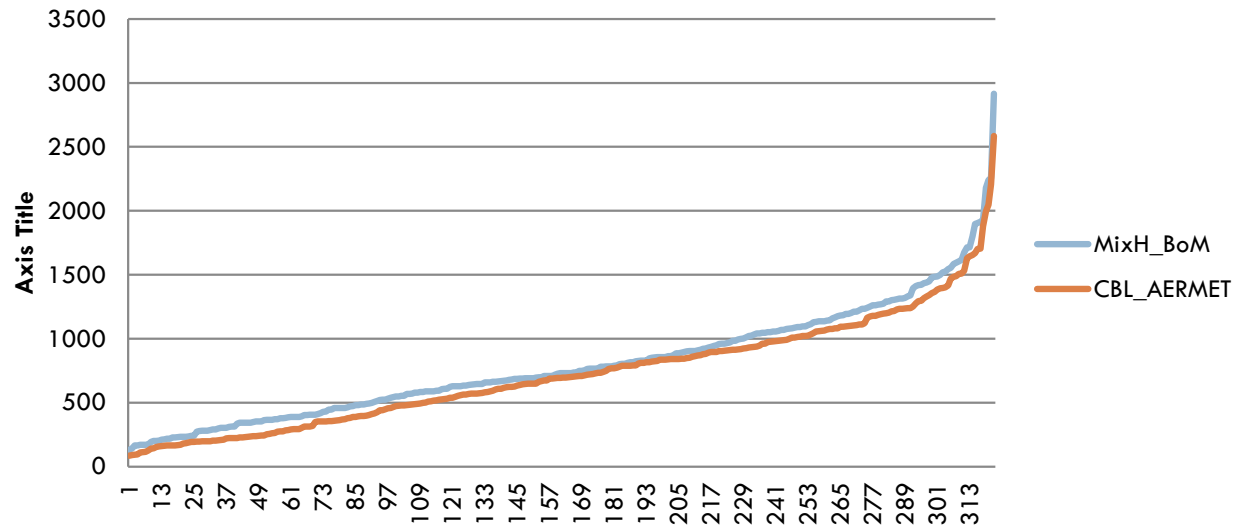
Real MixH Vs AERMET MixH



Performance – Magnitude of MixH

Magnitude
of MixH
quite
agree

Q-Q Plot of EPA MixH Calculation and AERMET MixH Calculations



Benkley and Schulman mtd. is
recommended

Availability of cloud info.

Round the clock cloud availability is poor in our part of the world

Representativeness is also an issue

Availability of cloud info. ctd.

Round the clock
cloud availability
is poor in our part
of the word

Representativeness
is also an issue



Resolving lack of cloud info.



Alternative to clouds

- Bulk Richardson number mtd.
- Net Radiation

US Alternative to clouds

Bulk Richardson number



Vertical temperature gradient is required to calculate equivalent cloud amount



Not available or rare in Australia



How good the estimations ????



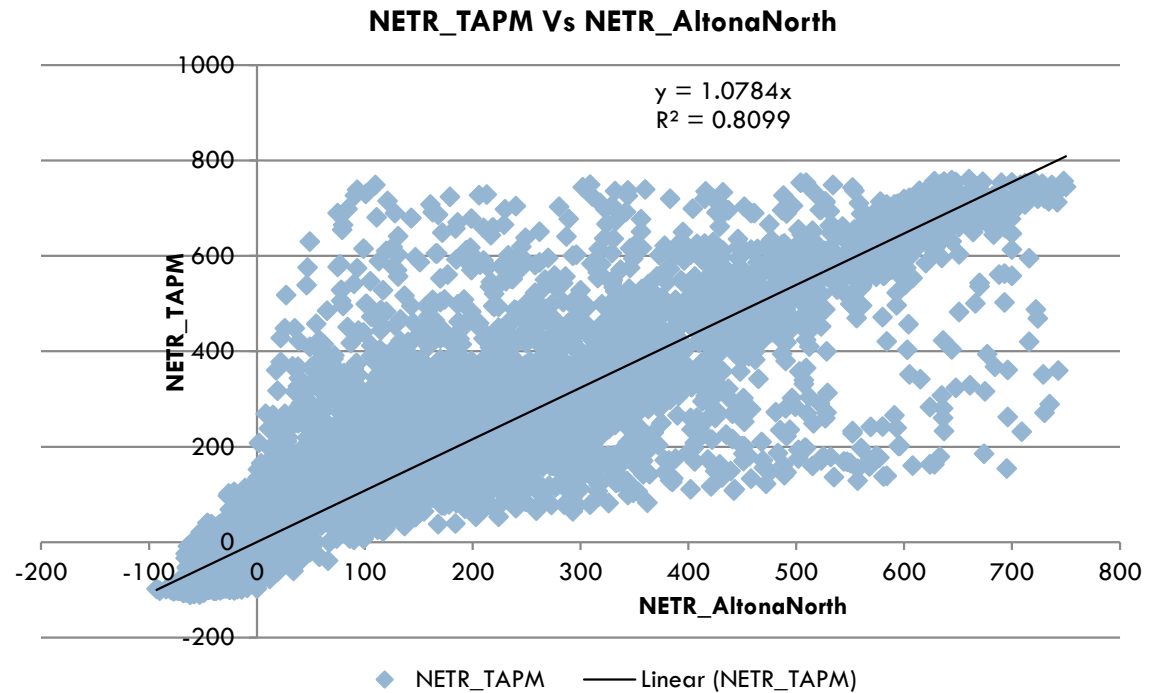
Cloud info. is required to calculate Net Radiation

Why not input Net Radiation directly ?

Direct input of Net Radiation is recommended

Alternative to clouds

Strong statistical relationship in between TAPM generated NetRad and observed NetRad



TAPM generated Net Radiation is recommended

Profile file (.pfl)

Vertical Profiles



Winds (WD,WS,SigmaV, SigmaW) and temperature at multiple levels required

- On-site data is required to include turbulence parameters when using AERMET



Wind Tower data



Not widely available



File may be constructed using single level data (Anemometer height) –accepted

Surface Characteristics

Suggest to use proposed land use categories and corresponding values available in the draft.

- Surface Roughness (1 Km radius, sector dependent)
- Albedo
- Bowen Ratio

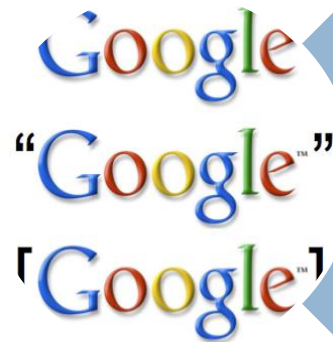
10KM by 10KM domain

Annual (Dry or Wet) and seasonal variations should be accounted.

Surface Characteristics



No national database available



Use land-use info. obtained from Google mapping system

- Interim solution

Use of Google mapping to find out surface characteristics

Met info is location dependent

Surface Roughness for
Altona North, VIC

METNewVersionAug13.xml

File Site Info Input Files Output Files Run Help About

Surface Met Site Met Sites' Info

Address: Altona North, VIC

Latitude: -37.835 Longitude: 144.847 Time Zone: 10

Northing: 5810345.229 Easting: 310814.311 UTM Zone: 55

Roughness Albedo Bowen

Number of sectors: 1

	Summer	Autumn	Winter	Spring
High intensity	0.0030	0.0030	0.0030	0.00

Single sector

1km x 1km

Roadmap

All sectors same All seasons same

Surface Roughness for
Altona, VIC

METNewVersionAug13.xml

File Site Info Input Files Output Files Run Help About

Surface Met Site Met Sites' Info

Address: Altona, VIC

Latitude: -37.869 Longitude: 144.830 Time Zone: 10

Northing: 5806450.383 Easting: 309393.762 UTM Zone: 55

Roughness Albedo Bowen

Number of sectors: 3

	Summer	Autumn	Winter	Spring
High intensity	0.0030	0.0030	0.0030	0.00
Open Water	0.0010	0.0010	0.0010	0.00
High intensity	0.0030	0.0030	0.0030	0.00

Three sectors

1km x 1km

Roadmap

All sectors same All seasons same

Same suburb, different locations

Use of Google mapping to find out surface characteristics

Surface Roughness
Determination

Segment
Dependency can be
considered

$1/r^2$ averaging is
done to determine
 Z_0 for a segment

The screenshot shows the pDsAUSMET software interface. The main window displays a Google Map with a circular sector overlay centered on a red pin. The map shows streets like Church St, Beach St, and Settlement Rd. The software interface includes a menu bar (File, Input Files, Site Info, Output Files, Run, QA/QC, About) and a 'Met Sites' Info tab. The 'Address' field contains coordinates: -38.452047, 145.228959. Other fields include Latitude (-38.452), Longitude (145.229), Time Zone (10), Count Rainy Days (0 days), Northing (5742541.380), Easting (345461.021), and UTM Zone (55). The 'Roughness' tab is active, showing a table of surface roughness values for different land uses across four seasons (Summer, Autumn, Winter, Spring). The table has 7 rows and 5 columns. The values are as follows:

	Summer	Autumn	Winter	Spring
Land Use	0.5094	0.5094	0.3162	0.4567
Land Use	0.4000	0.4000	0.3000	0.4000
Land Use	0.4000	0.4000	0.3000	0.4000
Land Use	0.3878	0.3878	0.3000	0.3878
Land Use	0.4000	0.4000	0.3000	0.4000
Land Use	0.4000	0.4000	0.3000	0.4000
Land Use	0.2813	0.2813	0.2110	0.2813

Met Processor for our part of the world

construction



EPA, VIC draft guidelines
“Construction of input
meteorological data files for
regulatory air model
(AERMOD) of EPA, Victoria”
helps you develop a met
processor for AERMOD.

Australian MetProcessor done by pDs



Thank you