NSW GOVERNMENT | Environment, Climate Change & Water

MONITORING OF DUST EMISSION IN EASTERN AUSTRALIA:

Why two methods are better than one

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NSW GOVERNMENT Office of Environment & Heritage

DustWatch SOUTH EAST

Dust is an indicator of landscape health

- Wind erosion emits dust in to the atmosphere
- Dust is an approved resource indicator in Australia
- Dust Storm Index has been the measure since 1998 (McTainsh 1998)

NSW GOVERNMENT Office of Environment & Heritage

DustWatch SOUTH EAST

Dust for as an indicator of soil condition

Poor management practice

⇩

Low ground cover

⇩

Dust source

⇩

Declining resource condition

Condition Report

⇧

Best management practice

⇩

Good ground cover

⇩

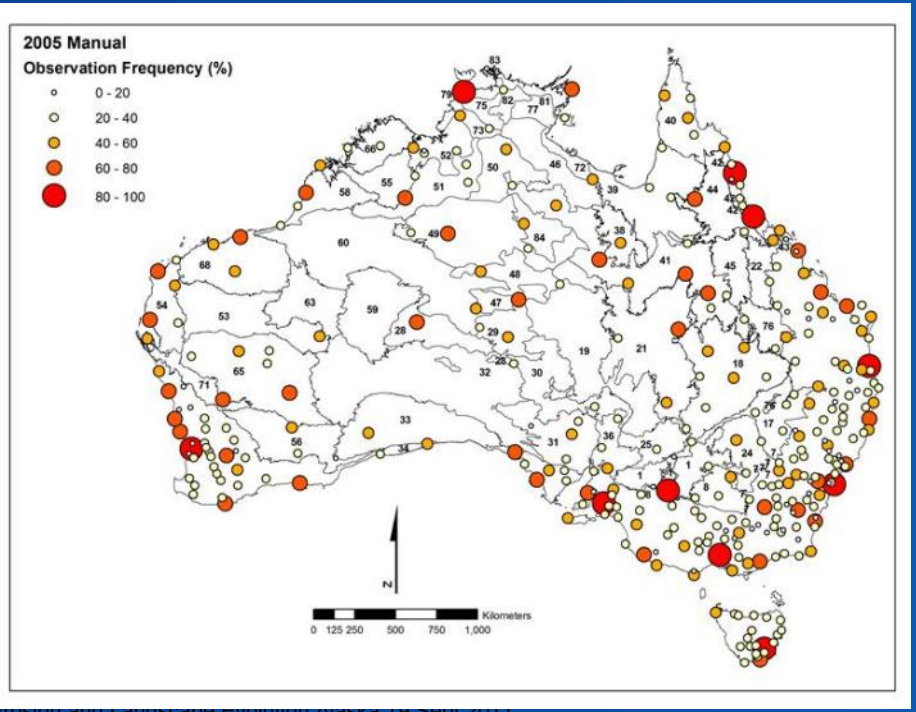
No dust

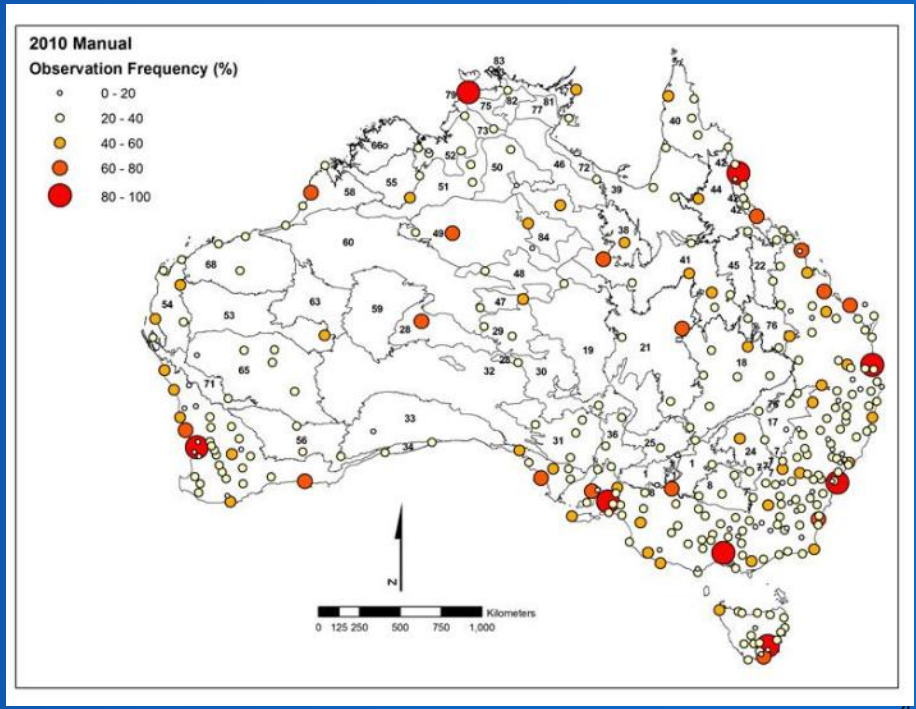
⇩

Improve / maintain condition

The problem – gaps in BoM data

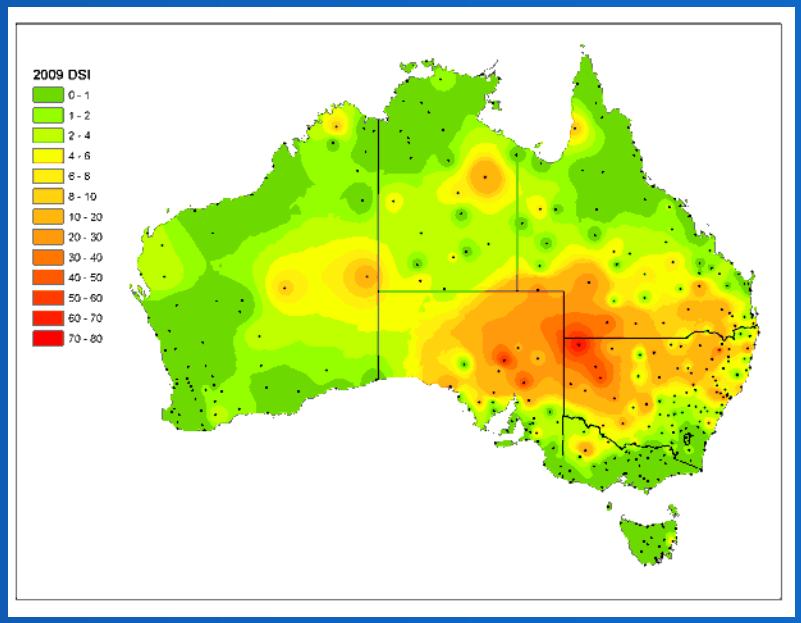
- Number of sites being monitored by BoM is declining (810 in 1974 to 424 in 2010)
- The number of obs /day is also dropping





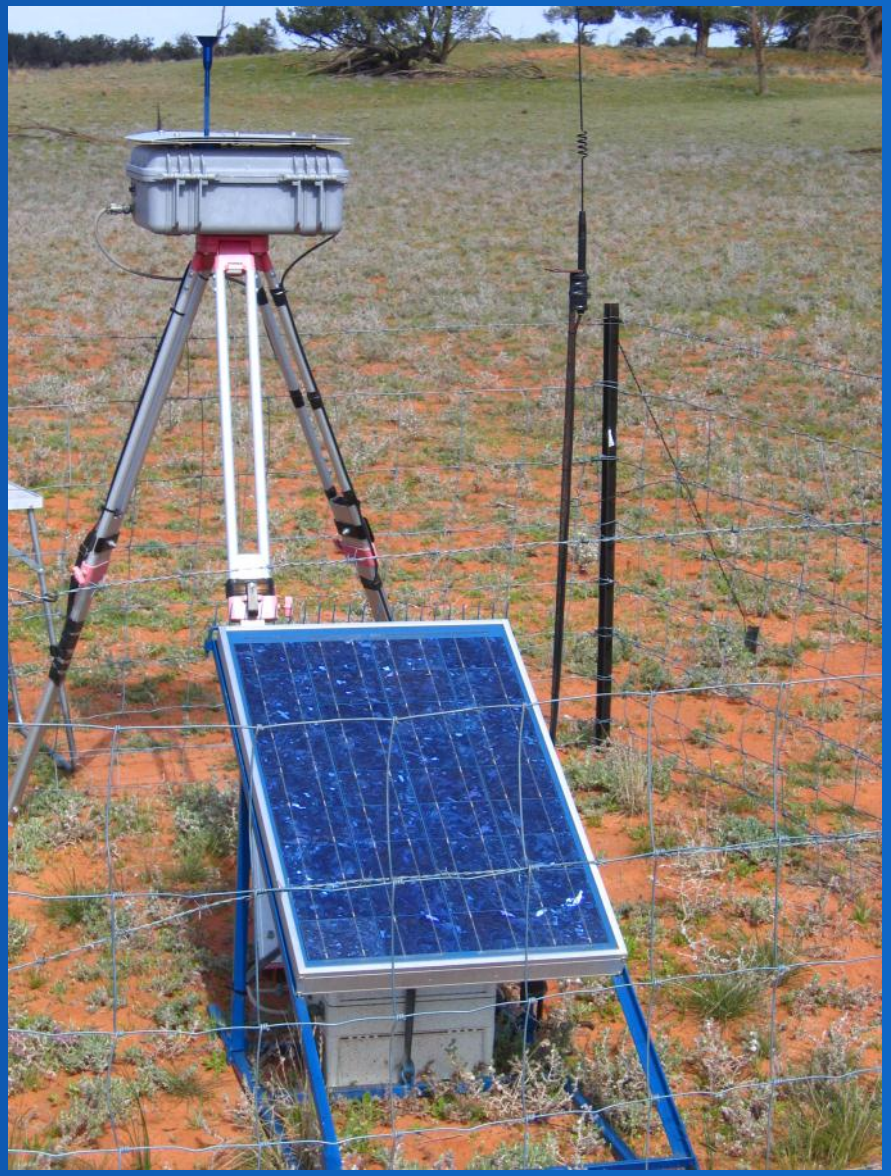
The challenge

- **Can the new high resolution DustWatch record be used to continue on the Dust Storm Index?**



DustWatch data

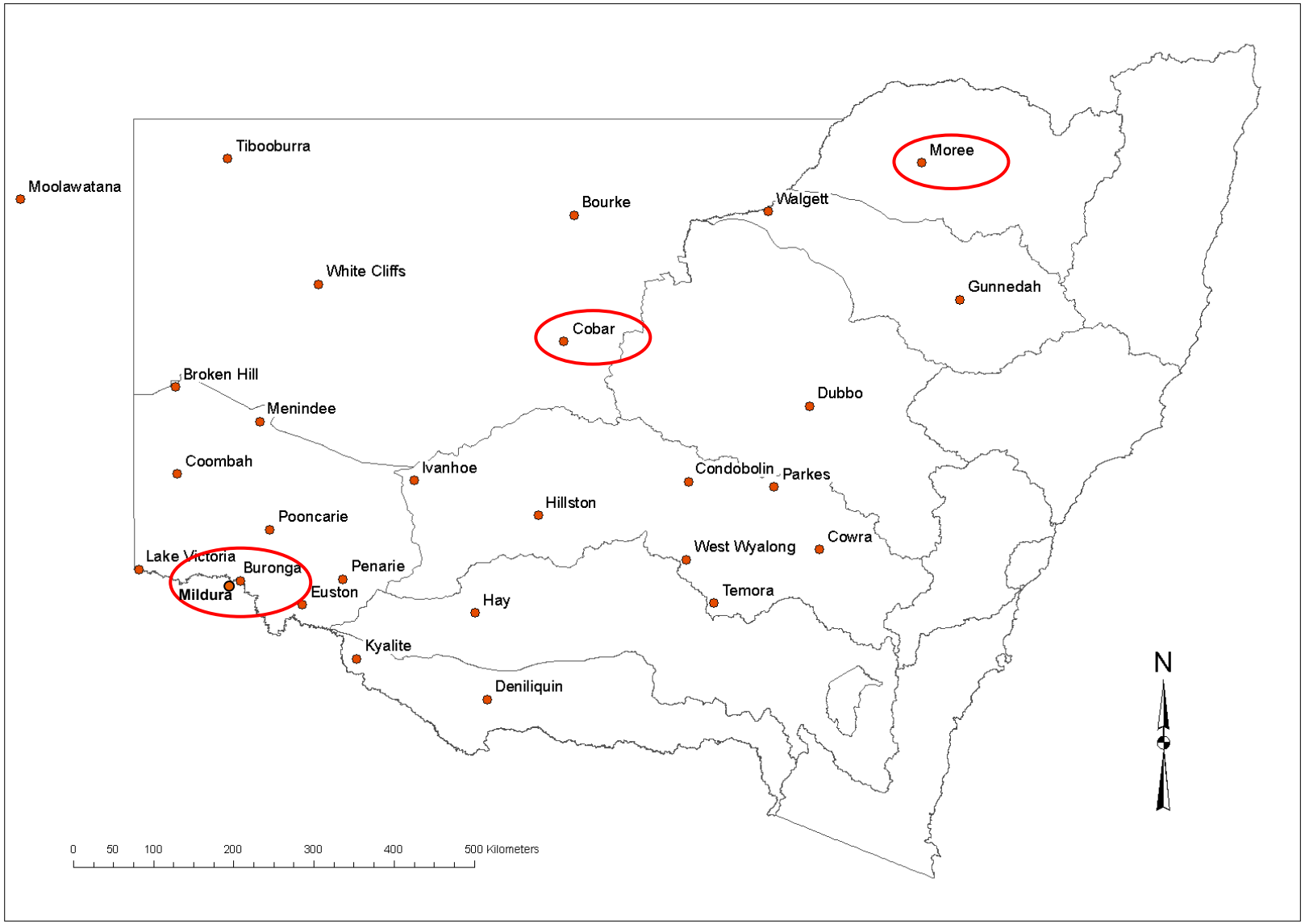
- Continuous monitoring with DustTrak® PM_{10}
- 15 min readings then 1 min when PM_{10} > 25µg/m^3
- 1 hour averages
- Sometimes co-located at BoM stations



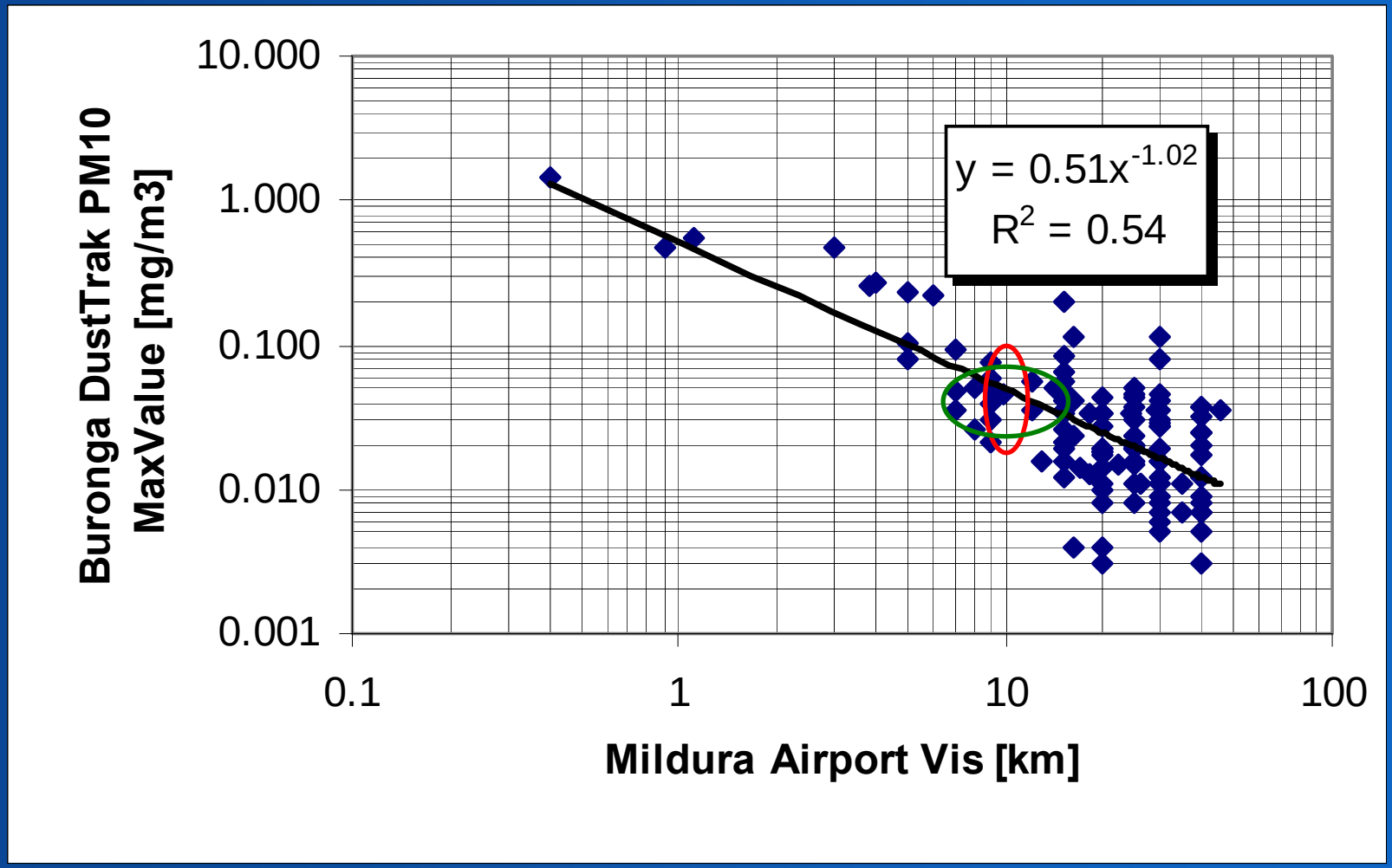
Methods – annual (July to June)

- Pick 3 good BoM sites with co-located DustWatch nodes
- Calculate the DSI from DustWatch PM_{10} data

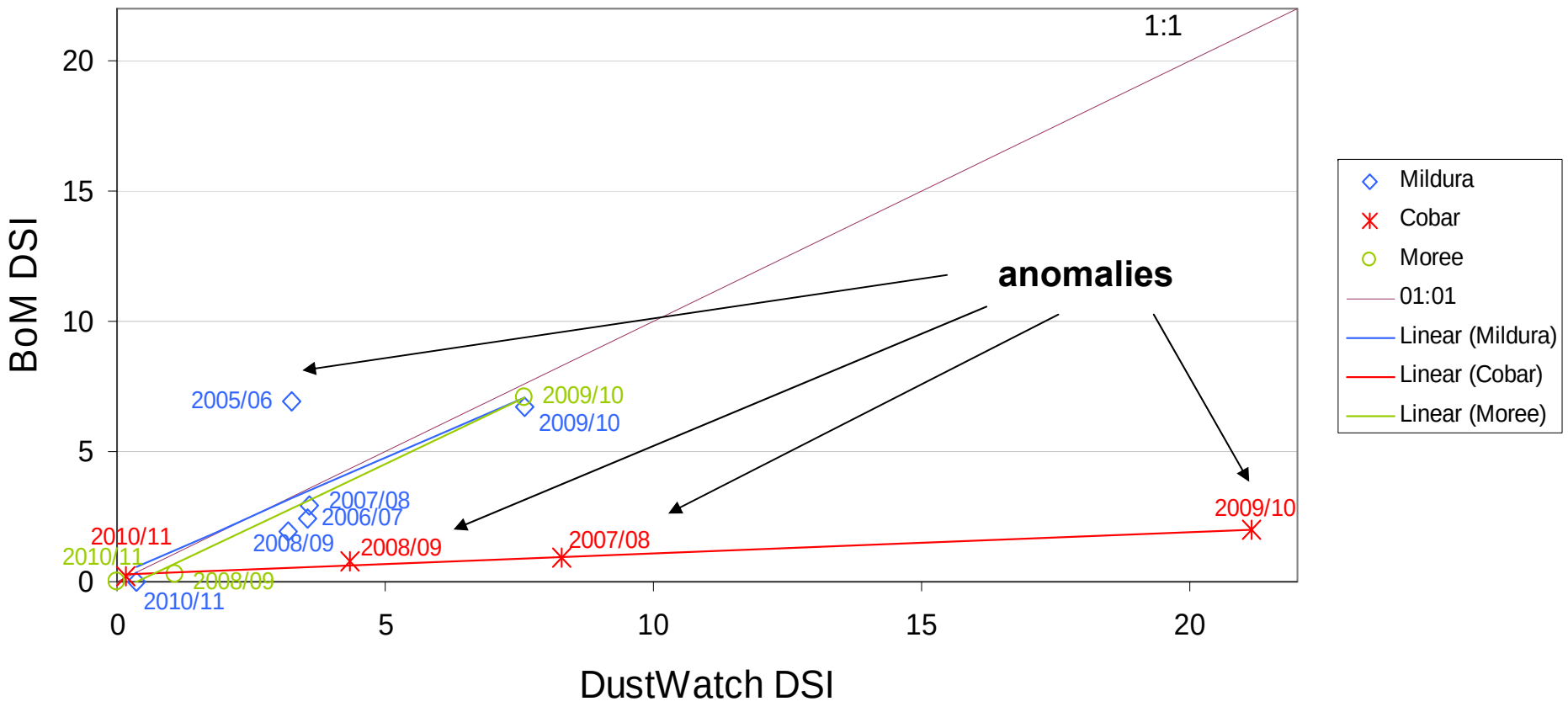
  ➔ PM_{10} concentration
  ➔ visibility
  ➔ BoM weather code
  ➔ DSI_{DW}
- Compare annual DSI_{DW} vs. DSI_{BoM}


Tibooburra
Moolawatana
Bourke
Walgett
Moree
White Cliffs
Gunnedah
Cobar
Broken Hill
Dubbo
Menindee
Coombah
Ivanhoe
Condobolin
Parkes
Hillston
Pooncarie
West Wyalong
Cowra
Lake Victoria
Buronga
Penarie
Mildura
Euston
Hay
Temora
Kyalite
Deniliquin
N
0 50 100 200 300 400 500 Kilometers

Visibility to PM_{10} relationship



Annual DSI_{DW} vs. DSI_{BoM}



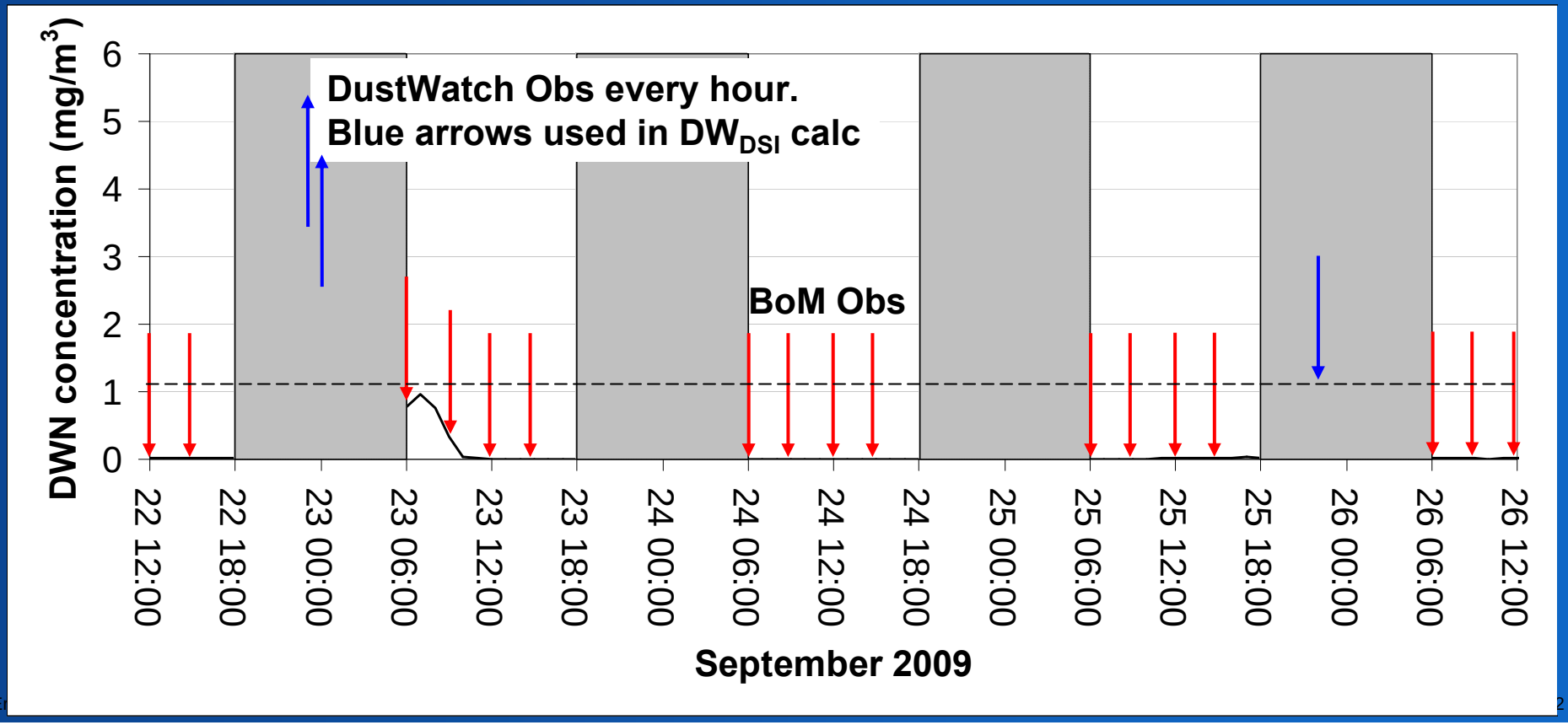
Mildura 2005/06

- The BoM_{DSI} 6.9 driven by a single past weather SDS code on 14/07/2005 BUT:
  - the TSP in Buronga was very low (5.89 µg/m^3)
  - the visibility records for Mildura showed no reduction in visibility (i.e. < 30 km) that day.
  - humidity was too low to justify fog (<80%)
  - wind speeds were low (~10km/h)
- The DustWatch data for early on 14/07/2005 shows aerosol in the air but the DustWatch QA suggests it was smoke.
- Therefore this observation was removed from BoM_{DSI}

Cobar 2009/10

In 2007/08 missed obs also occurred

- The DW_{DSI} is driven by several SDS in September 2009 (DSI = 15.0 out of 21.15)



Cobar 2008/09

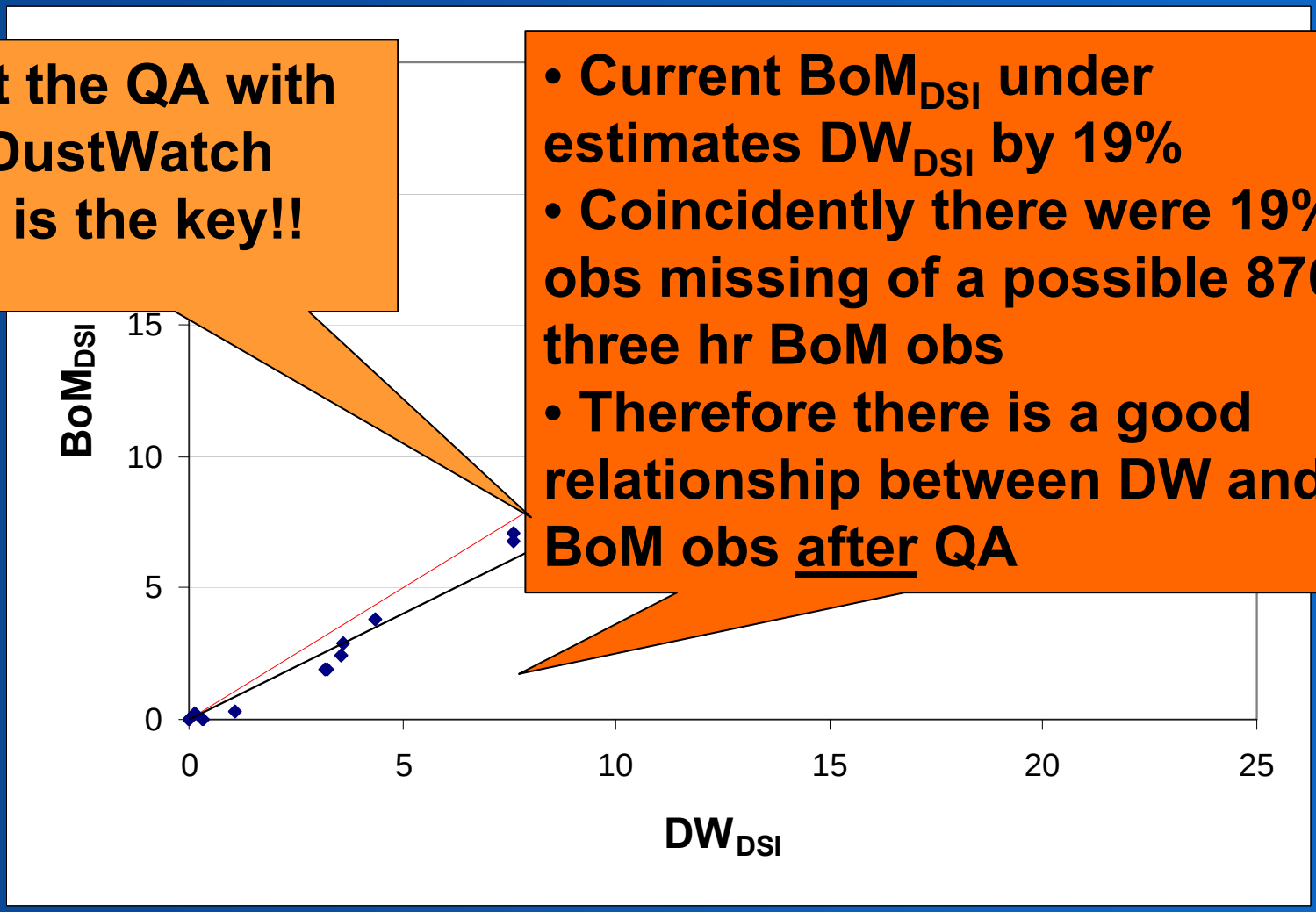
- The DW_{DSI} for 2008/09 is driven by September 2008 (1.15) and March 2009 (2.15).
- The differences between the BoM and DustWatch arise from the BoM use of the Local Dust Event code (LDE) which has no visibility associated with it AND the code thresholds

Date	BoM Code	PM_{10} (mg/m^3)	DW threshold (mg/m^3)
15 Sept 2008	LDE	0.253	MDS > 0.240
03 March 2009	Nothing recorded	0.310	MDS > 0.240
04 March 2009	LDE	0.605	MDS > 0.240

Corrected DSI values

- But the QA with the DustWatch data is the key!!

- Current BoM_{DSI} under estimates DW_{DSI} by 19%
- Coincidently there were 19% obs missing of a possible 8760 three hr BoM obs
- Therefore there is a good relationship between DW and BoM obs <u>after</u> QA



Conclusions

- Two methods are better than one:
  - Can calculate DSI from DW data
  - Longevity of monitoring and increased QA
- DustWatch can increase the QA of BoM records and visa versa BUT we would need a DustWatch site at each BoM site
- Not possible to extrapolate DW data to neighbouring BoM stations due to temporal variability


Questions?
JADE DustWatch site