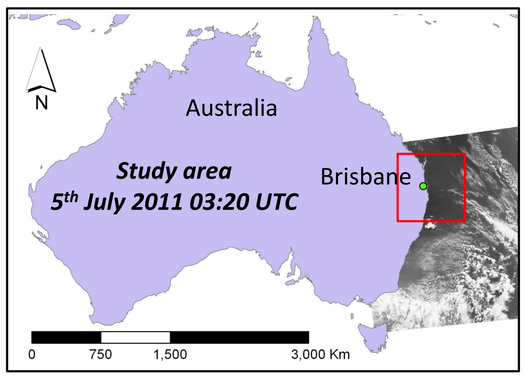
Comparing Remotely Sensed and Modelled Aerosol Optical Properties; a Case Study for Brisbane Australia.

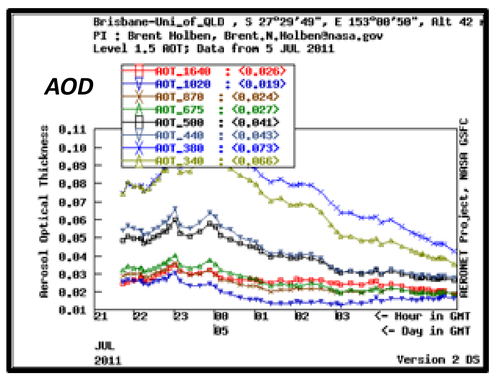
1 Introduction

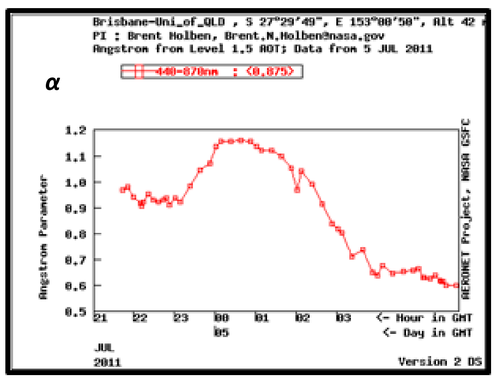
Compared aerosol optical depth (AOD) and aerosol size distribution (α) from 8 WRF-Chem aerosol transport and gas-phase chemistry schemes to AERONET and MODIS - to determine which model configuration should be used in a local scale, low AOD, aerosol affect on rainfall study.



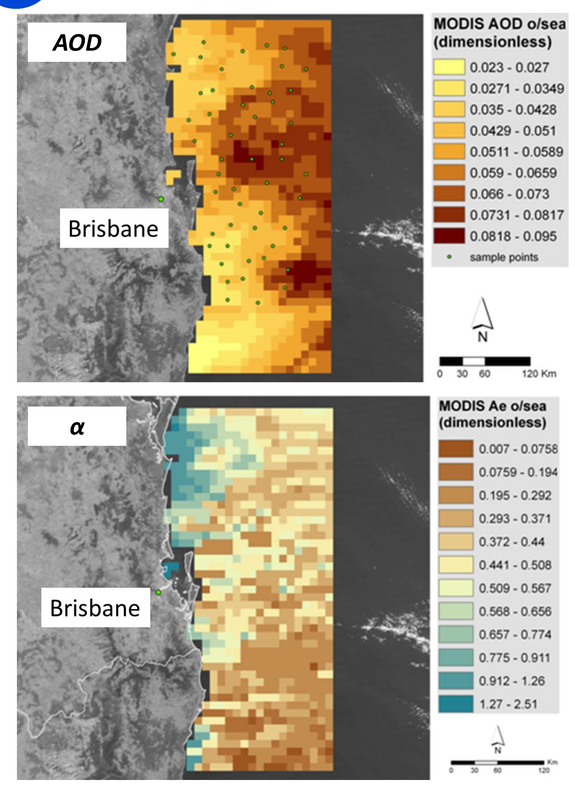
2 AERONET AOD/α

The Brisbane AERONET sun-photometer AOD/α were compared with MODIS closest 10 pixel averaged AOD/α - to justify a MODIS to model α comparison in the low aerosol load environment.

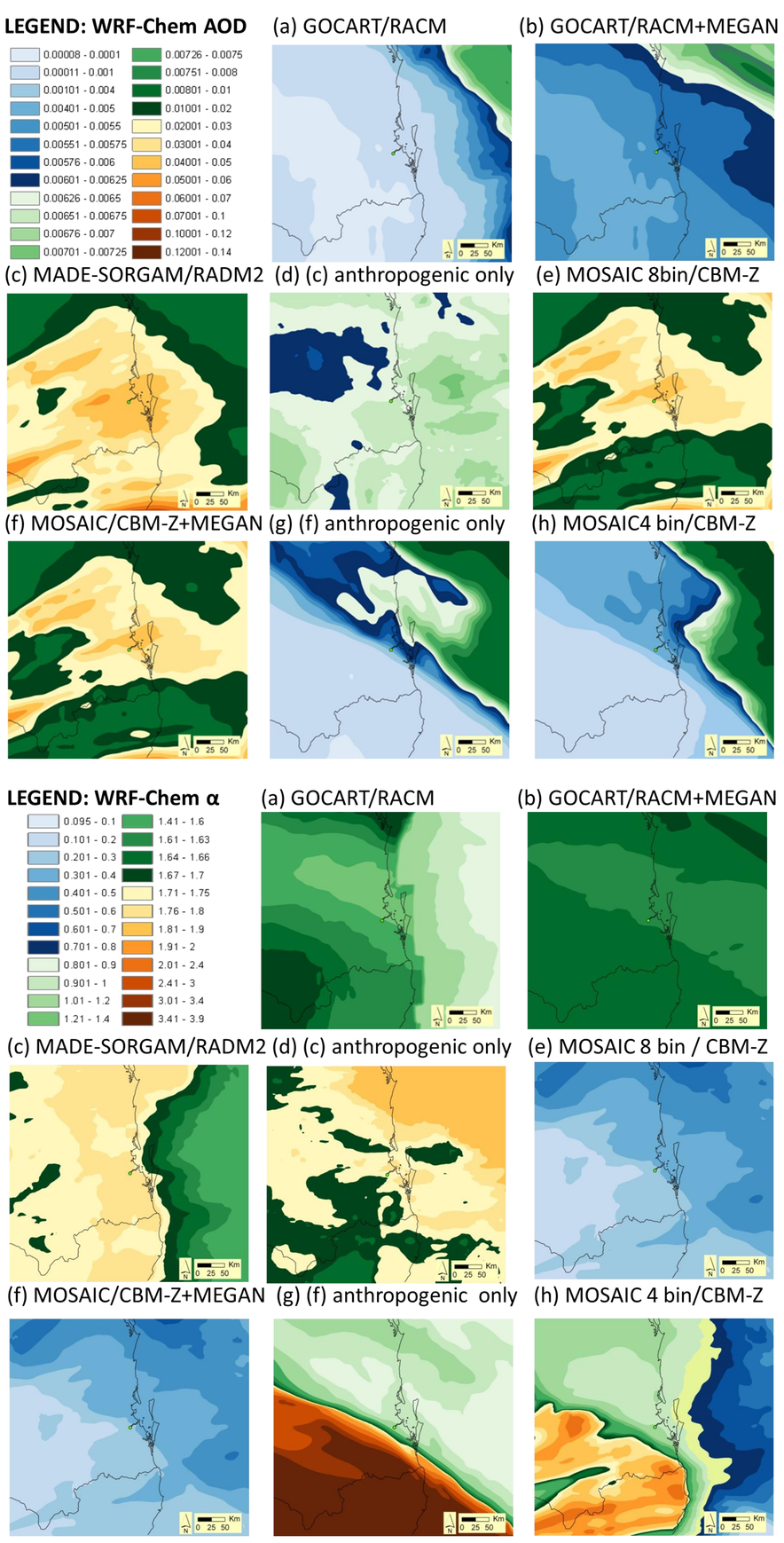




3 MODIS AOD/α



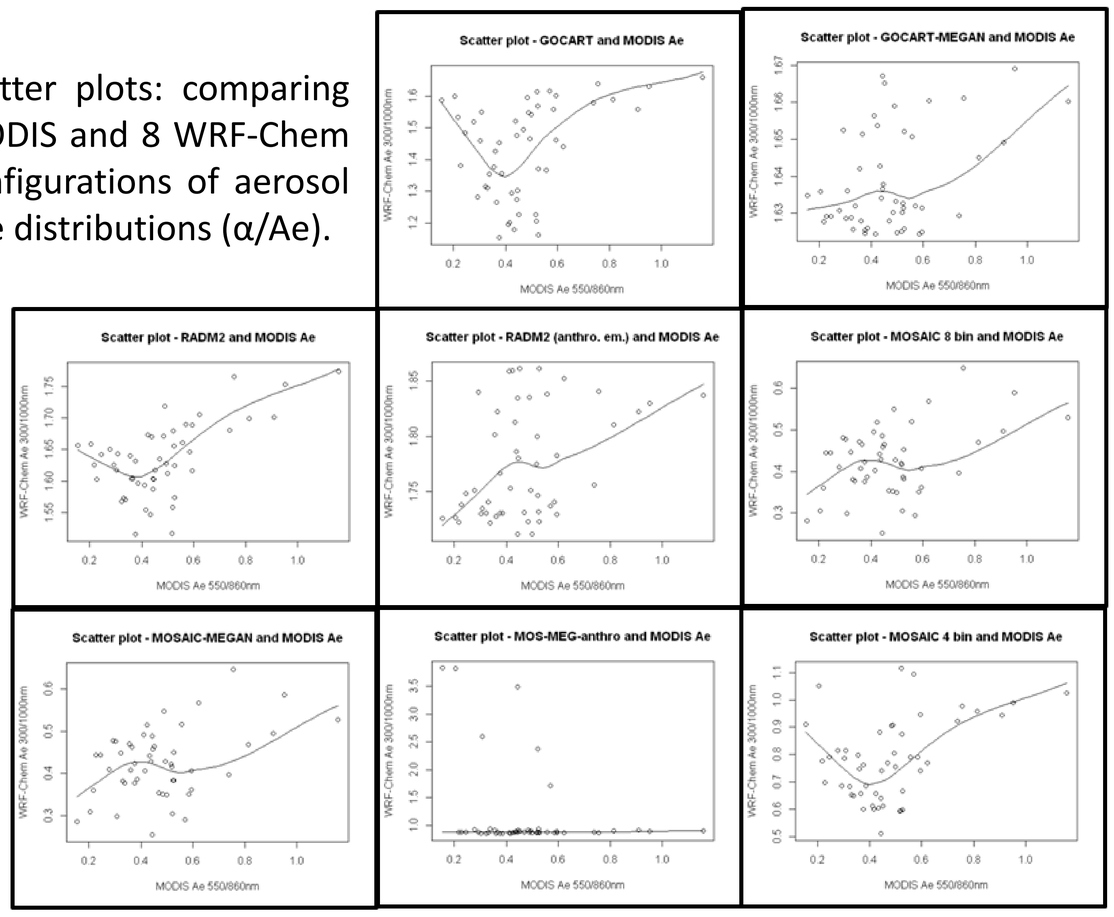
4 WRF-Chem model AOD/α for 8 schemes



WRF-Chem under-predicts AOD and has less coarse mode α for the specific study due to natural aerosol source emission spatial resolution verses model domain size. MOSAIC and MADE-SORGAM schemes replicate some features of MODIS AOD/α.

5 Correlation Analysis

Scatter plots: comparing MODIS and 8 WRF-Chem configurations of aerosol size distributions (α/Ae).

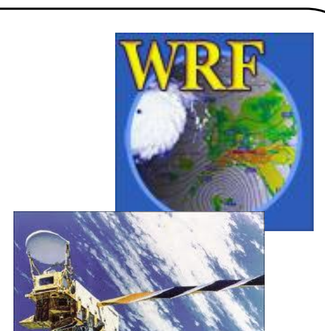


Instrument or WRF-Chem Scheme	At AERONET location		MODIS v WRF-Chem image mean α correlation		
	AOD	α	ρ	T	RMSE
AERONET	0.045	0.82			
MODIS mean closest 10 pixels	0.047	1.13			
GOCART/RACM	0.005	1.63	0.34	0.21	1.206
GOCART/RACM-MEGAN	0.005	1.63	0.43	0.16	1.544
MADE-SORGAM/RADM2	0.04	1.71	0.45	0.25	1.506
- anthropogenic emissions only	0.006	1.73	0.44	0.29	1.64
MOSAIC (8 bin)/CBM-Z	0.027	0.29	0.45	0.1	0.183
MOSAIC (8 bin)/CBM-Z-MEGAN	0.027	0.29	0.45	0.1	0.183
- anthropogenic emissions only	0.005	0.92	-0.3	0.07	1.079
MOSAIC (4 bin)/CBM-Z	0.004	1.01	0.61	0.36	0.306

For the study date, time and location, the similarity of AERONET and MODIS AOD/α values justifies an image-wide comparison of MODIS and WRF-Chem α. With lower root-mean-square-error (RMSE) values the image-wide MOSAIC-4 bin α is strongly correlated with MODIS α at ρ=0.61.

6 Conclusion

While MOSAIC/CBM-Z are known improved WRF-Chem aerosol transport and gas-phase chemistry schemes, it was found to be computational resource expensive, as well as being biased to coarse mode aerosol for the 8-bin configuration. MADE-SORGAM/RADM2 aerosol size distributions output was a more pragmatic option.



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