

*A preliminary comparison of some surface variables in the
BMRC MOLTS with in-situ data for EOP3*

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Aim

- ? Is it useful to directly compare MOLTS with in-situ data?
 - Model is not the real world!
- ? What techniques/methods are useful?
 - Time series techniques
 - ? Basic statistics
 - ? STL (R – package)
 - ? Wavelet transforms

Comparison

- ? Well known/characterized
 - Surface pressure
- ? Less well known – more sub-grid scale
 - Screen level temperature and moisture
 - Surface wind
- ? Poorly known – extreme scale dependence
 - precipitation

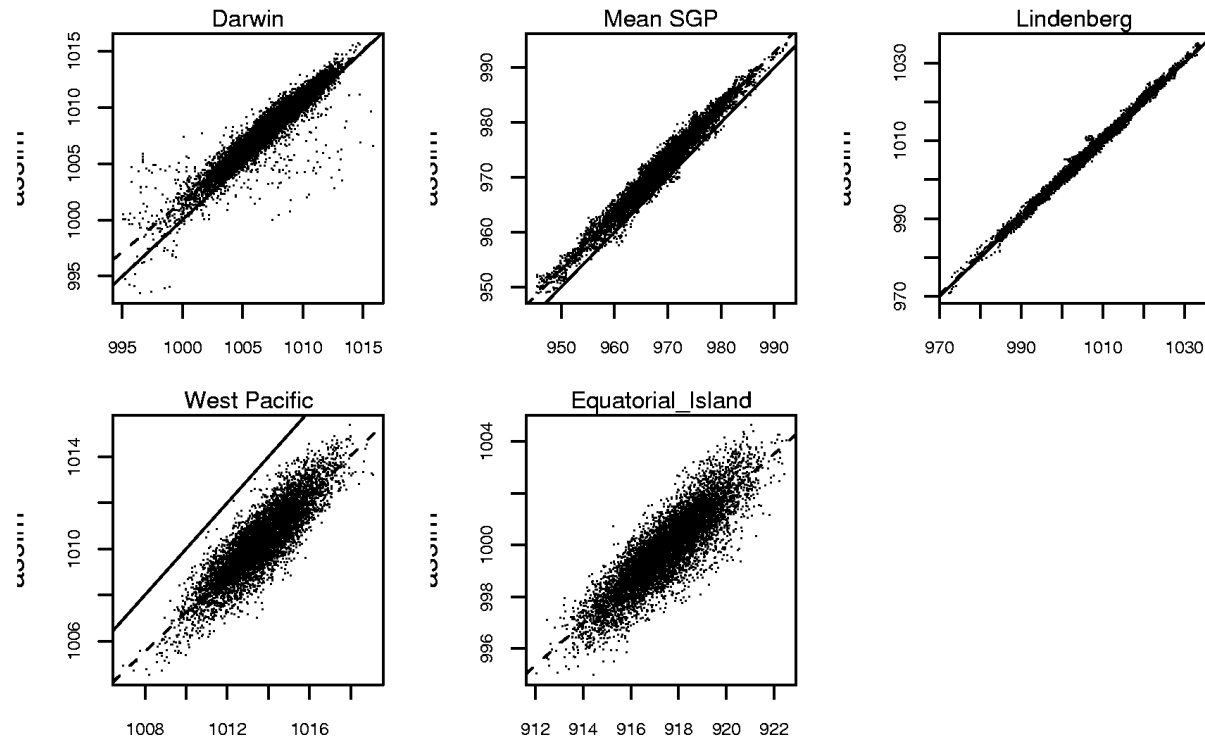
Locations

		<i>in-situ</i>			<i>MODEL</i>		
<i>Name</i>	<i>Surface</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Elevation</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Elevation</i>
Lindenberg	land	52.17	14.12	73	52.02	13.2	76.51
SGP	land	36.61	-97.49	313	36.3	-98.1	379.46
WPO	sea	7.04	134.27	2	7.11	134.25	-7.64
Equatorial Island	land	-0.2	100.32	699	-0.37	99.75	90.39
MDB	land	-35.66	148.15	1200	-35.55	147.6	472.59
Darwin	land	-12.43	130.89	30	-12.35	130.5	18.81
Ringwood (SGP)	land	36.43	-98.28	418	36.3	-98.1	379.46
Kyeamba (MDB)	land	-35.43	147.2	212	-35.55	147.6	472.59

Surface pressure

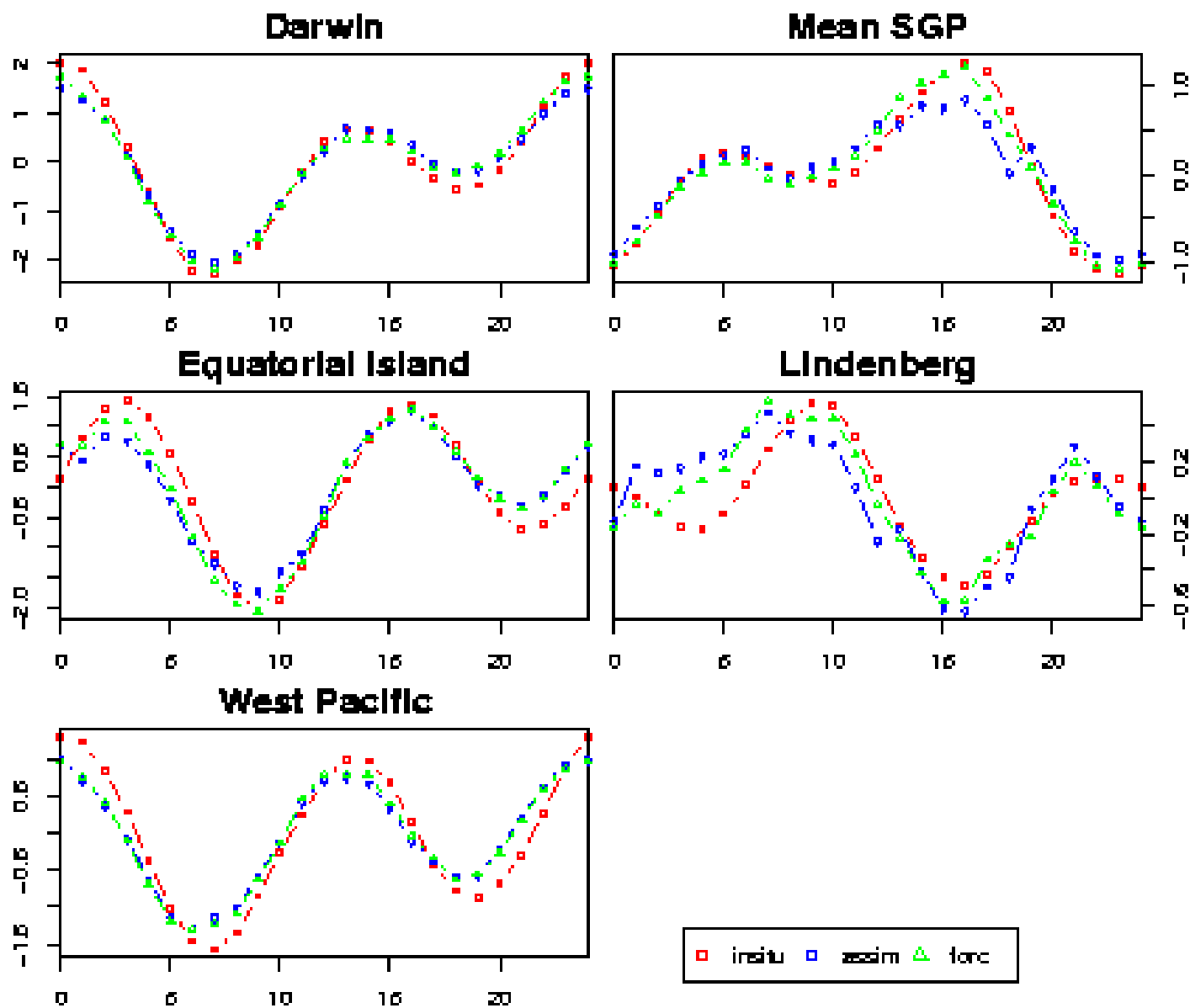
	Assimilation			Forecast			Variance		
	<i>RMS</i>	<i>BIAS</i>	<i>Corr</i>	<i>RMS</i>	<i>BIAS</i>	<i>Corr</i>	<i>In_situ</i>	<i>Assim</i>	<i>Forc</i>
Lindenberg	0.89	0.37	1	1.9	-0.23	0.98	85.26	85.67	100.81
ARM-SGP	3.29	3	0.98	3.59	2.53	0.93	46.66	47.69	49.93
Equatorial Island	82.35	82.35	0.87	82.45	82.44	0.86	2.51	2.21	2.39
WPO	3.39	-3.3	0.87	3.28	-3.16	0.85	2.49	2.36	2.34
ARM-Darwin	1.36	0.91	0.94	1.49	0.86	0.92	9.14	8.29	8.47
Ringwood (SGP)	4.53	4.39	0.99	4.59	3.98	0.95	51.43	49.44	52.06
ARM-Darwin (Orig)	1.59	0.95	0.92	1.69	0.89	0.89	10.08	8.29	8.47

Surface Pressure [hPa]

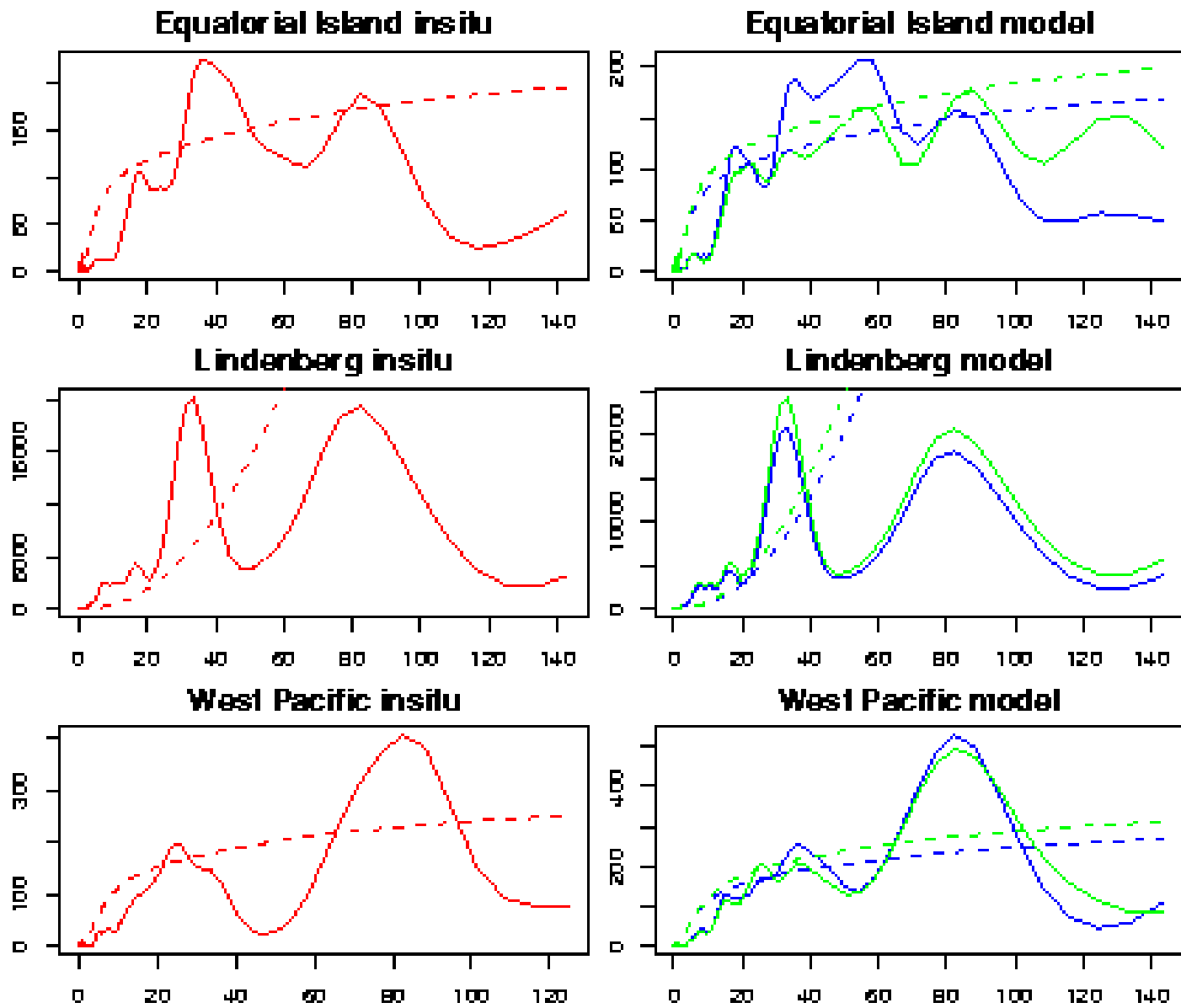


Diurnal variation of Surface Pressure

Bin average method



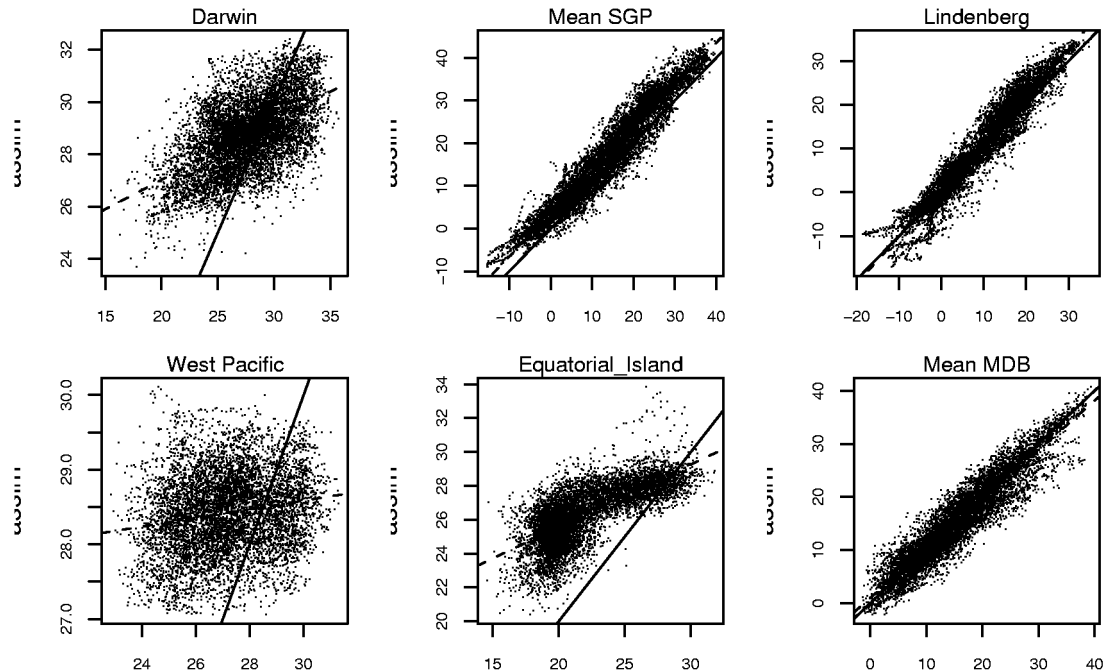
Global wavelet spectrum for Surface Pressure



Screen Temperature

	<i>Assimilation</i>			<i>Forecast</i>			<i>Variance</i>		
	<i>RMS</i>	<i>BIAS</i>	<i>In_situ</i>	<i>RMS</i>	<i>BIAS</i>	<i>Corr</i>	<i>In_situ</i>	<i>Assim</i>	<i>Forc</i>
Lindenberg	3.28	1.24	0.96	3.91	2.19	0.96	92.93	115.81	121.24
ARM-SGP	4.75	3.5	0.96	5.74	4.33	0.95	126.5	137.17	147.31
Equatorial Island	4.91	4.3	0.72	4.87	4.26	0.72	10.64	2.83	2.66
MDB	2.78	-0.13	0.94	3.03	0.13	0.93	64.03	62.6	63
WPO	2.05	1.24	0.18	2.01	1.17	0.19	2.7	0.28	0.34
ARM-Darwin	2.92	1.09	0.55	2.99	1.07	0.5	10.24	1.71	1.86
Ringwood (SGP)	4.28	2.56	0.96	5.23	3.38	0.95	139.24	146.53	157.82
Kyeamba (MDB)	3.18	-1.14	0.94	3.32	-0.88	0.92	69.92	62.6	63

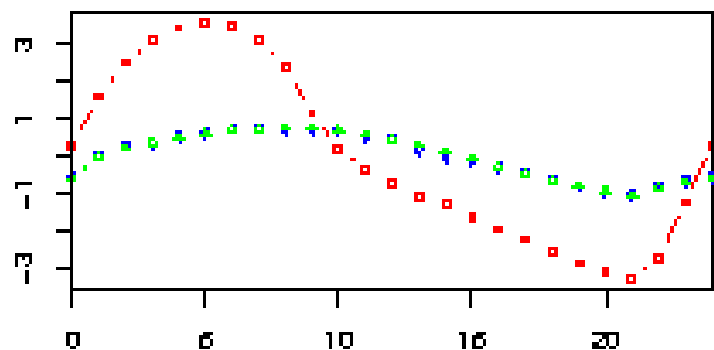
Screen Temperature [Celsius]



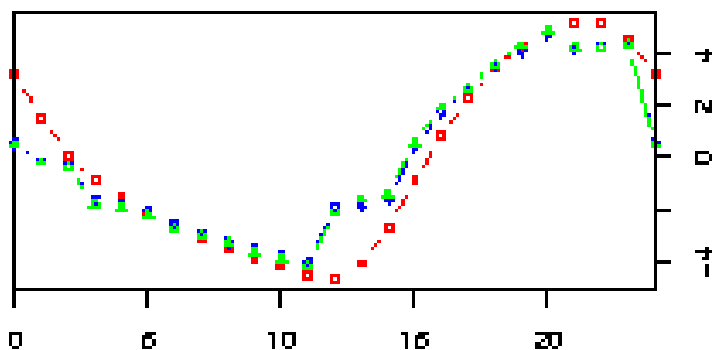
Diurnal variation of Screen Temperature

Bin average method

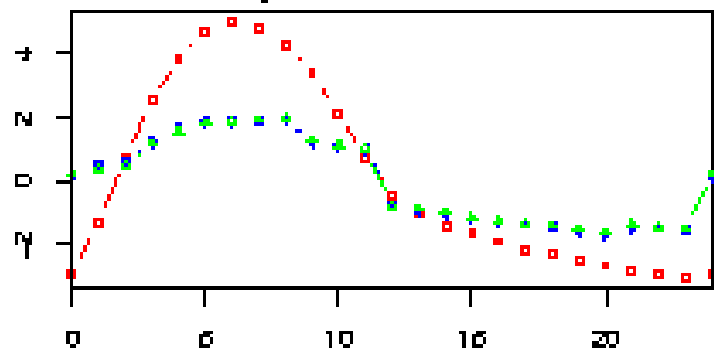
Darwin



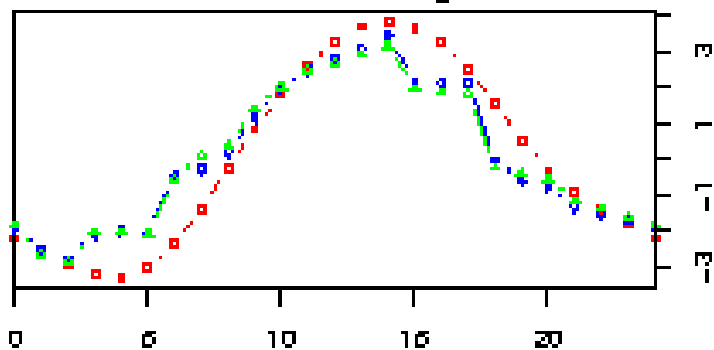
Mean SGP



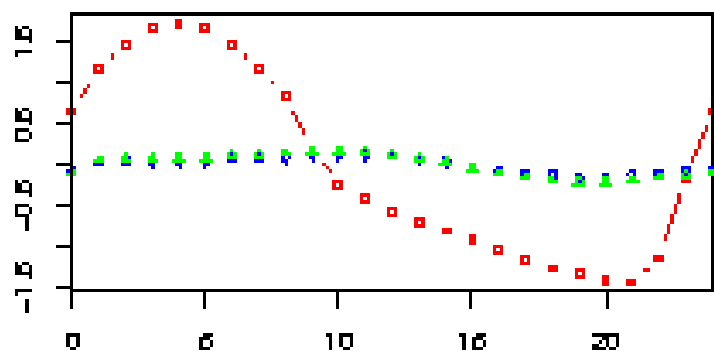
Equatorial Island



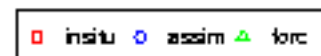
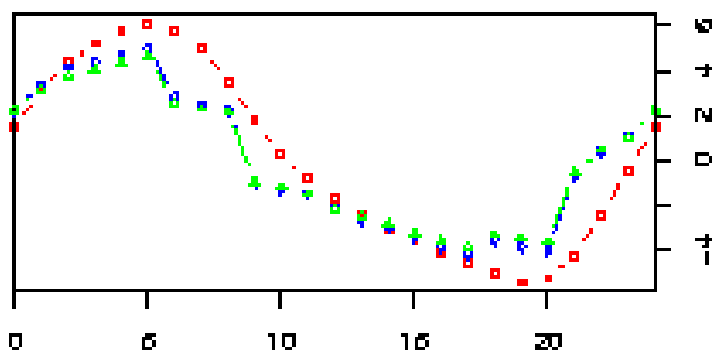
Lindenberg



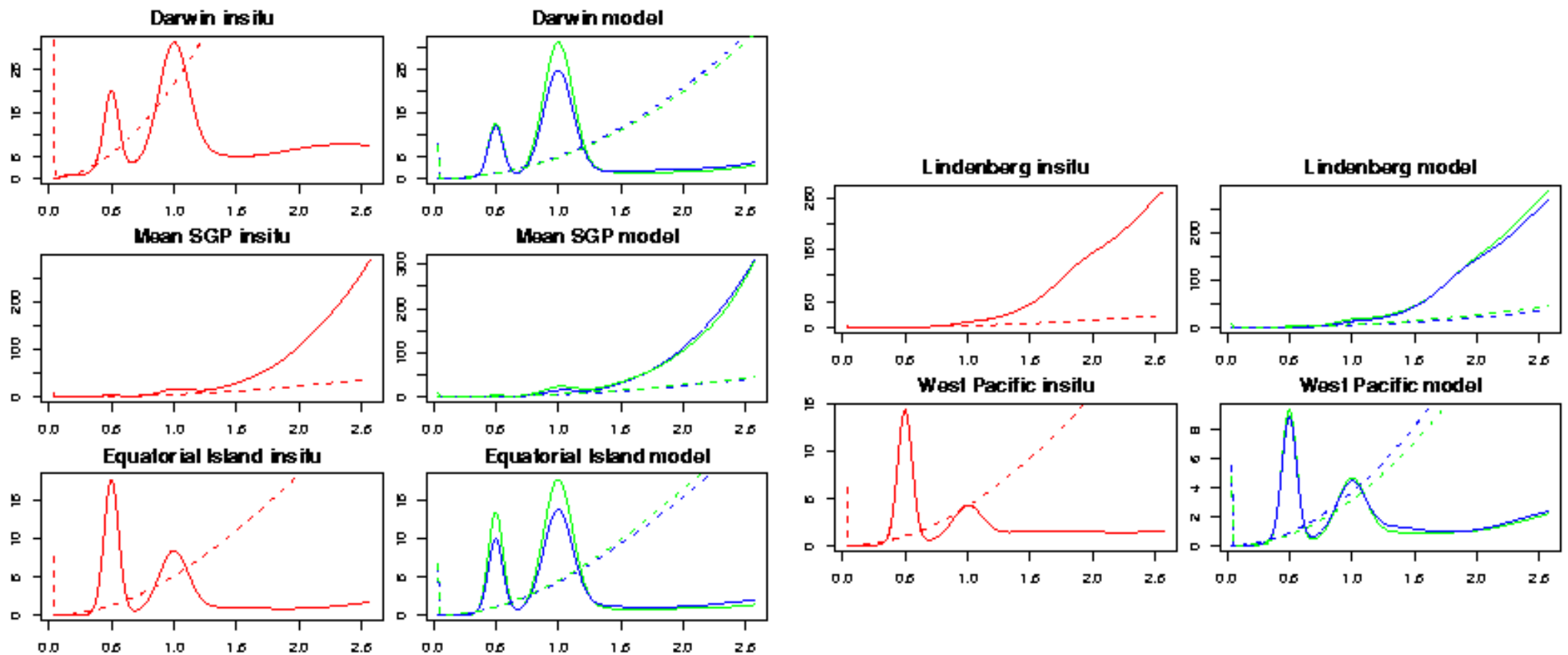
West Pacific



Mean MDB



Global wavelet spectrum for Surface Pressure

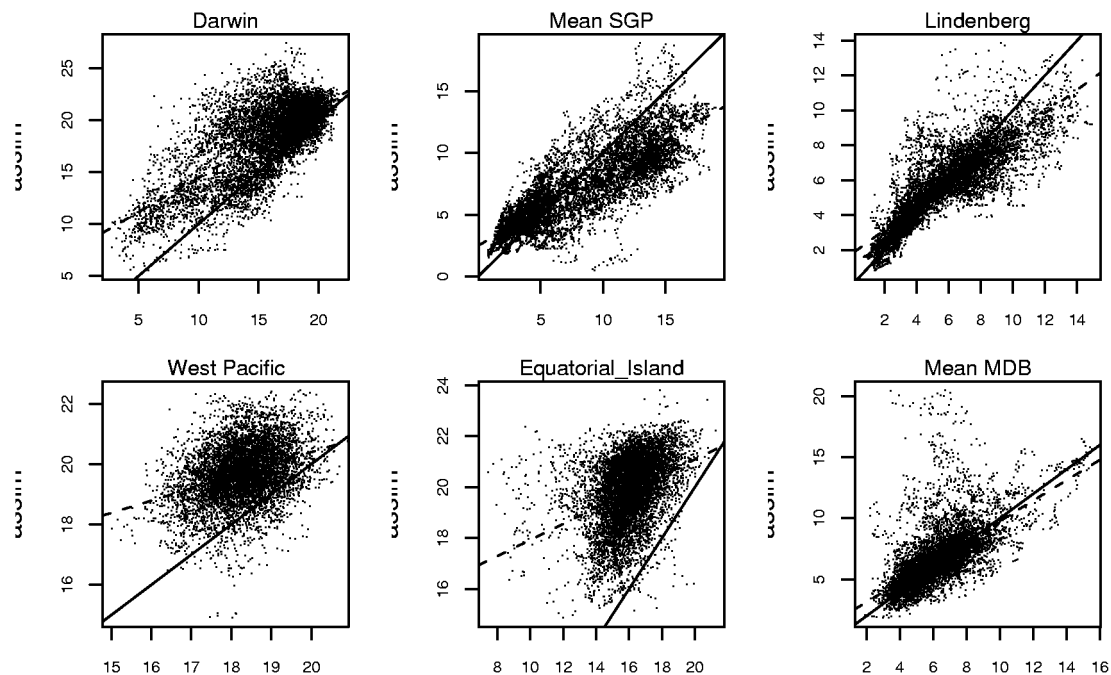


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Screen level specific humidity

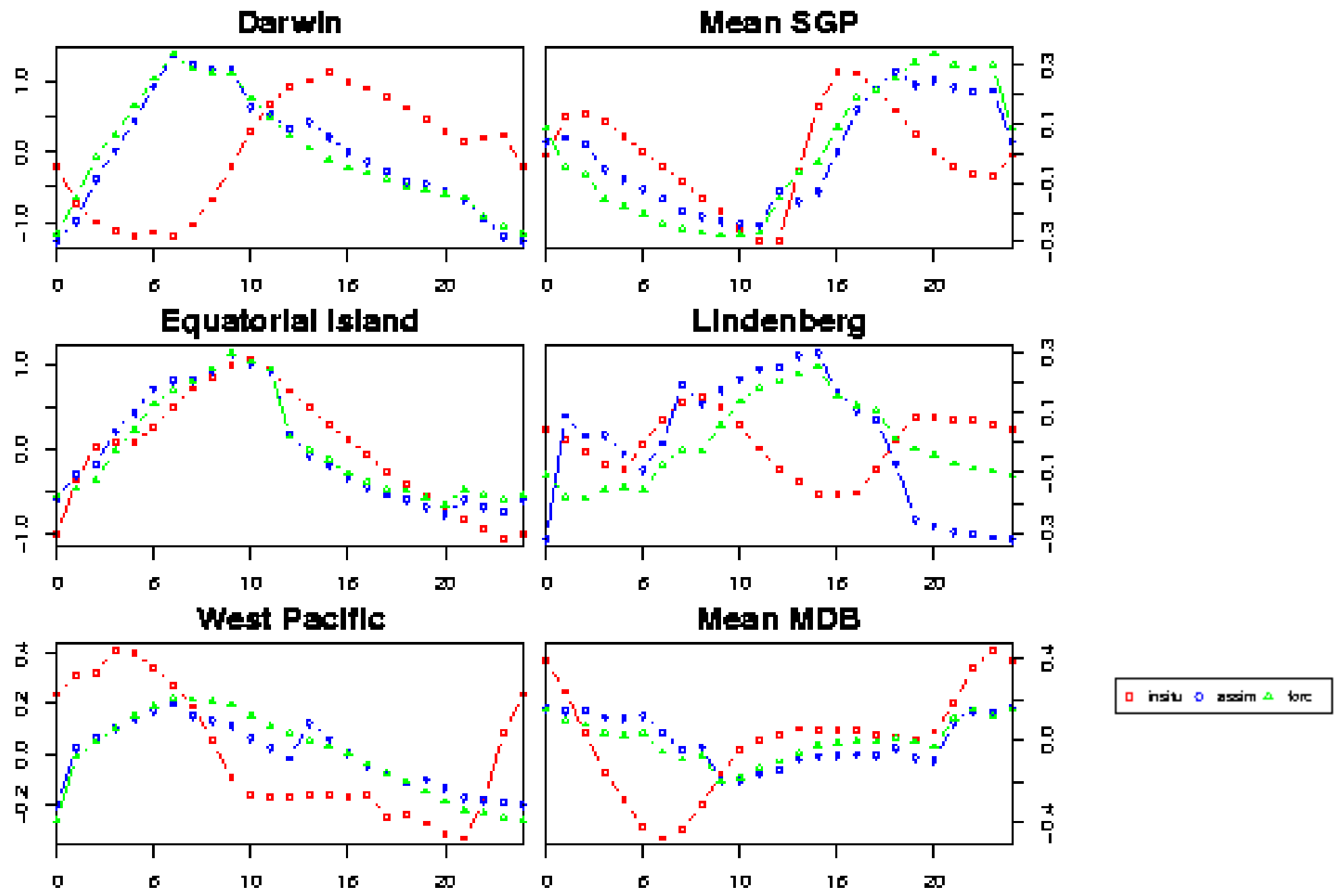
	<i>Assimilation</i>			<i>Forecast</i>			<i>Variance</i>		
	<i>RMS</i>	<i>BIAS</i>	<i>In_situ</i>	<i>RMS</i>	<i>BIAS</i>	<i>Corr</i>	<i>In_situ</i>	<i>Assim</i>	<i>Forc</i>
Lindenberg	1.45	-0.07	0.84	1.81	-0.08	0.74	7.21	4.54	4.08
ARM-SGP	2.79	-0.91	0.83	3.1	-0.73	0.76	21.15	9.95	10.89
Equatorial Island	4.16	3.82	0.37	4.05	3.73	0.38	2.39	1.79	1.6
MDB	1.87	0.44	0.64	1.83	0.53	0.65	3.23	5.47	5.1
WPO	1.75	1.43	0.34	1.68	1.28	0.31	0.62	0.9	1.06
ARM-Darwin	3.84	2.59	0.69	3.77	2.47	0.7	13.41	12.03	13.37
Kyeamba (MDB)	2.21	0.56	0.53	2.17	0.65	0.54	4.14	5.47	5.1

Screen Level Humidity [g/kg]

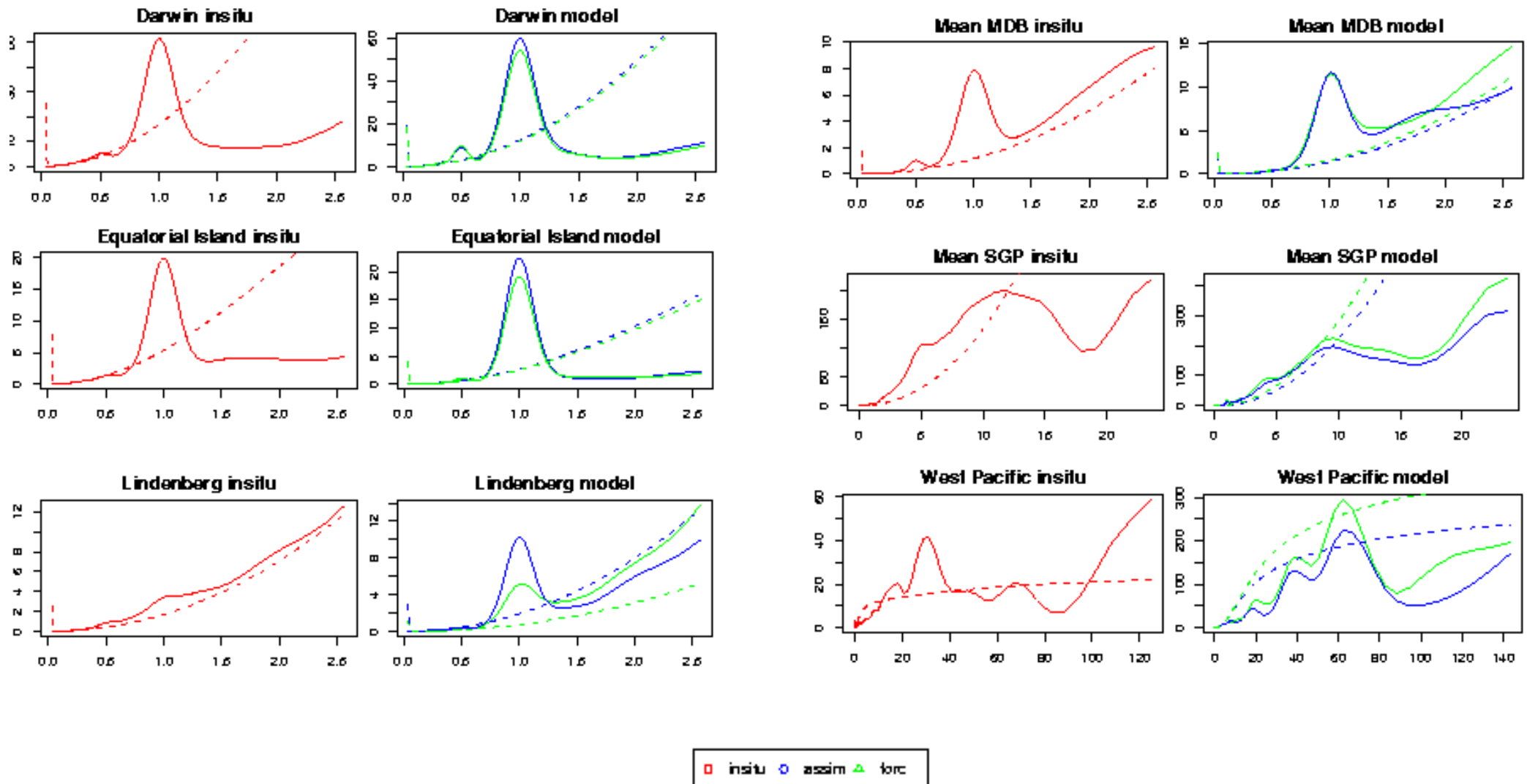


Diurnal variation of Screen Level Humidity

Bin average method



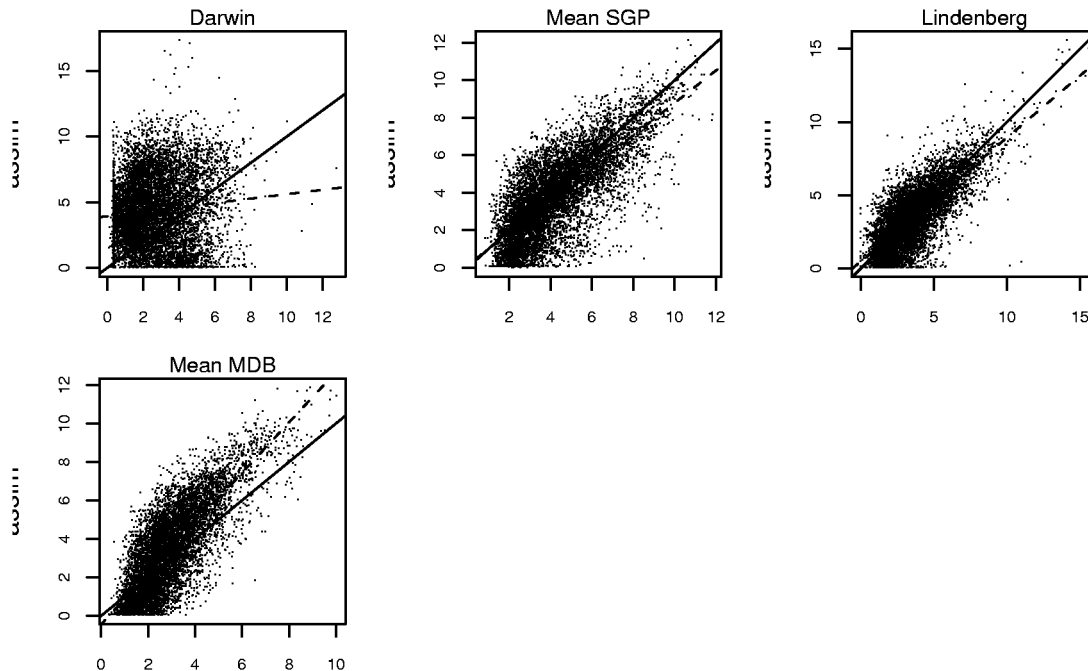
Screen level specific humidity



10m wind speed

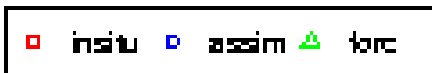
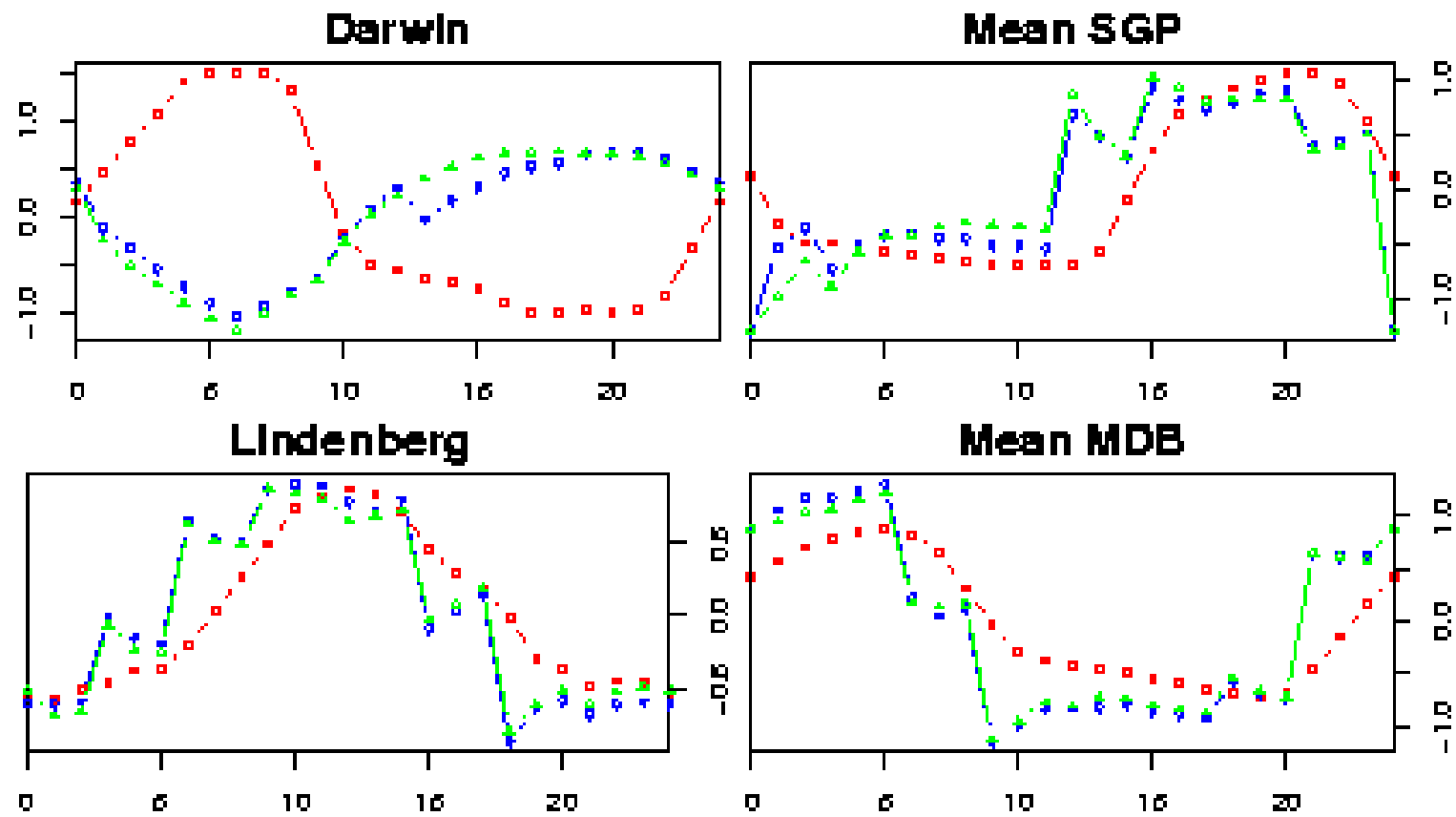
	<i>Assimilation</i>			<i>Forecast</i>			<i>Variance</i>		
	<i>RMS</i>	<i>BIAS</i>	<i>Corr</i>	<i>RMS</i>	<i>BIAS</i>	<i>Corr</i>	<i>In_situ</i>	<i>Assim</i>	<i>Forc</i>
Lindenberg	1.4	-0.08	0.76	1.53	0.08	0.71	3.6	4.44	4.46
ARM-SGP	1.51	-0.44	0.75	1.8	-0.25	0.63	3.51	4.66	4.84
MDB	1.5	0.45	0.79	1.61	0.53	0.74	1.8	4.97	4.88
ARM-Darwin	3.39	1.76	0.11	3.8	2.21	0.05	2.61	6.66	7.41
Ringwood (SGP)	1.99	-0.61	0.67	2.25	-0.44	0.55	5.93	4.74	4.87
Kyeamba (MDB)	1.85	0.56	0.63	1.95	0.63	0.58	2.77	4.97	4.88

10m Wind Speed [m/s]



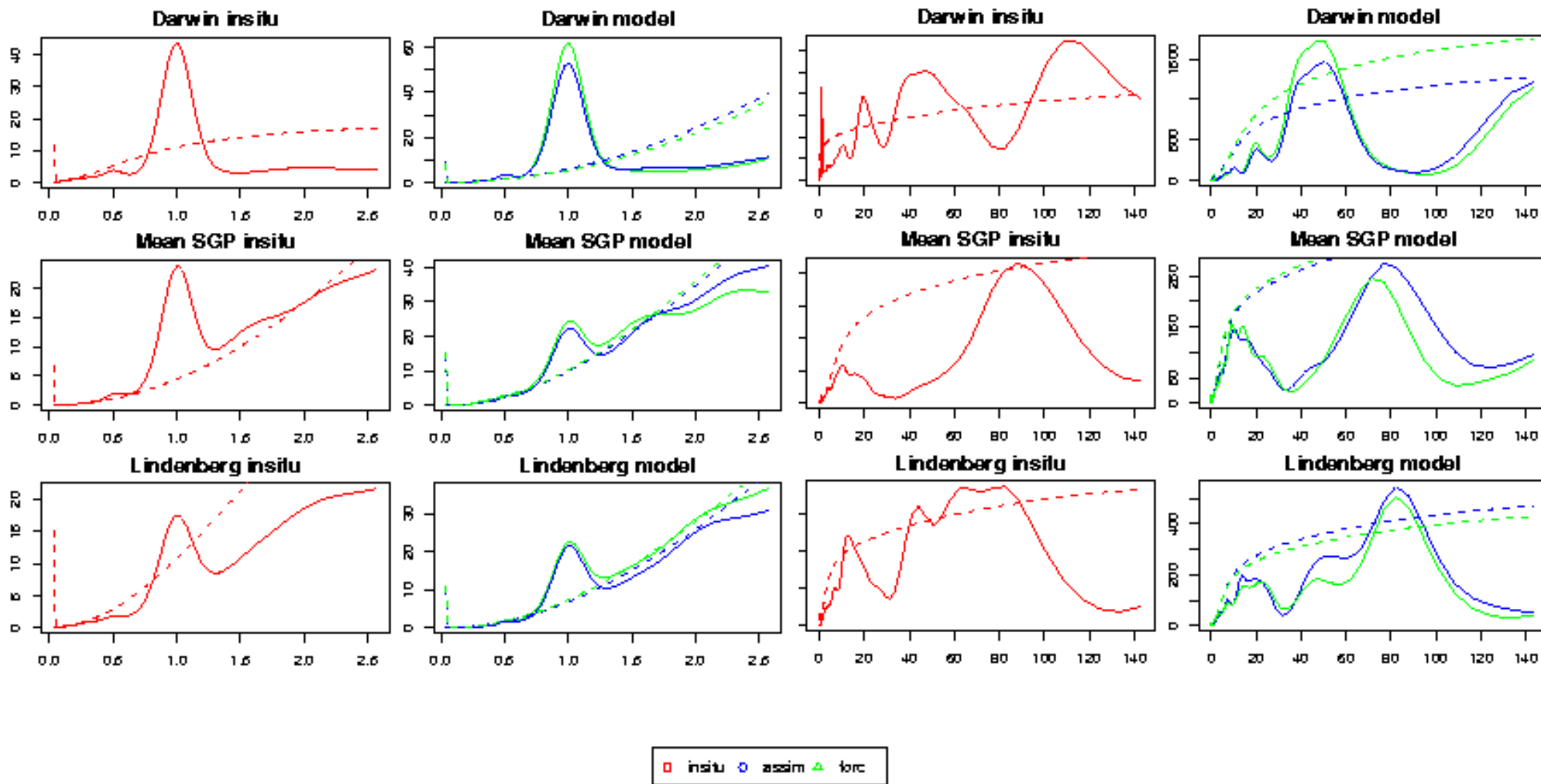
Diurnal variation of 10m Wind Speed

Bin average method



Global wavelet spectrum for 10m Wind Speed

Global wavelet spectrum for 10m Wind Speed



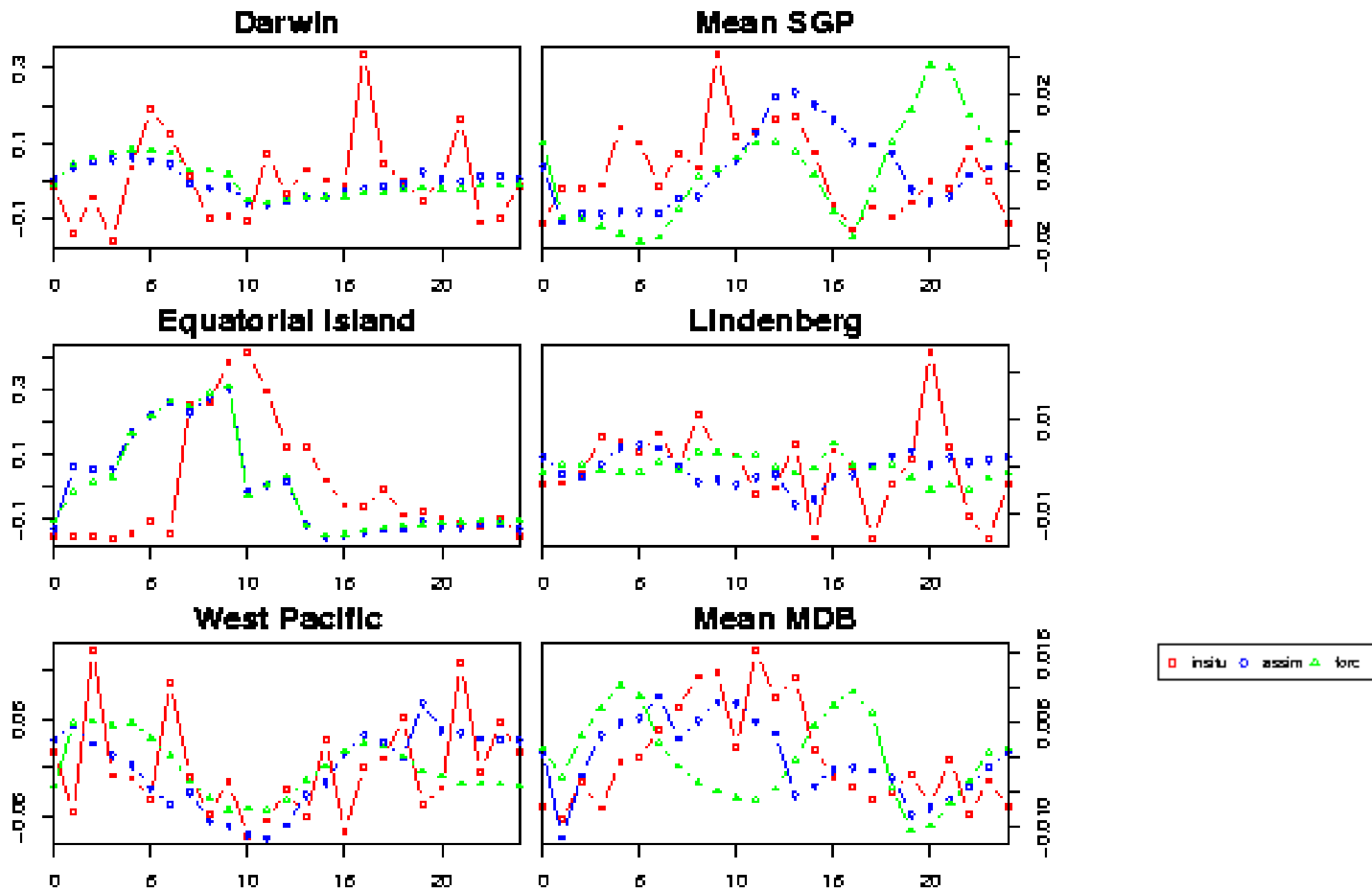
Precipitation

	<i>ASSIM</i>		<i>FORC</i>	
	<i>Ann. Ratio</i>	<i>Correlation</i>	<i>Ann. Ratio</i>	<i>Correlation</i>
Lindenberg	1.01	0.51	1.33	0.58
ARM-SGP	0.73	0.28	1.04	0.59
Equatorial Isla	1.53	0.44	1.28	0.4
MDB	1.18	0.84	1.87	0.73
WPO	1.58	0.75	1.57	0.73
ARM-Darwin	0.3	0.82	0.24	0.9

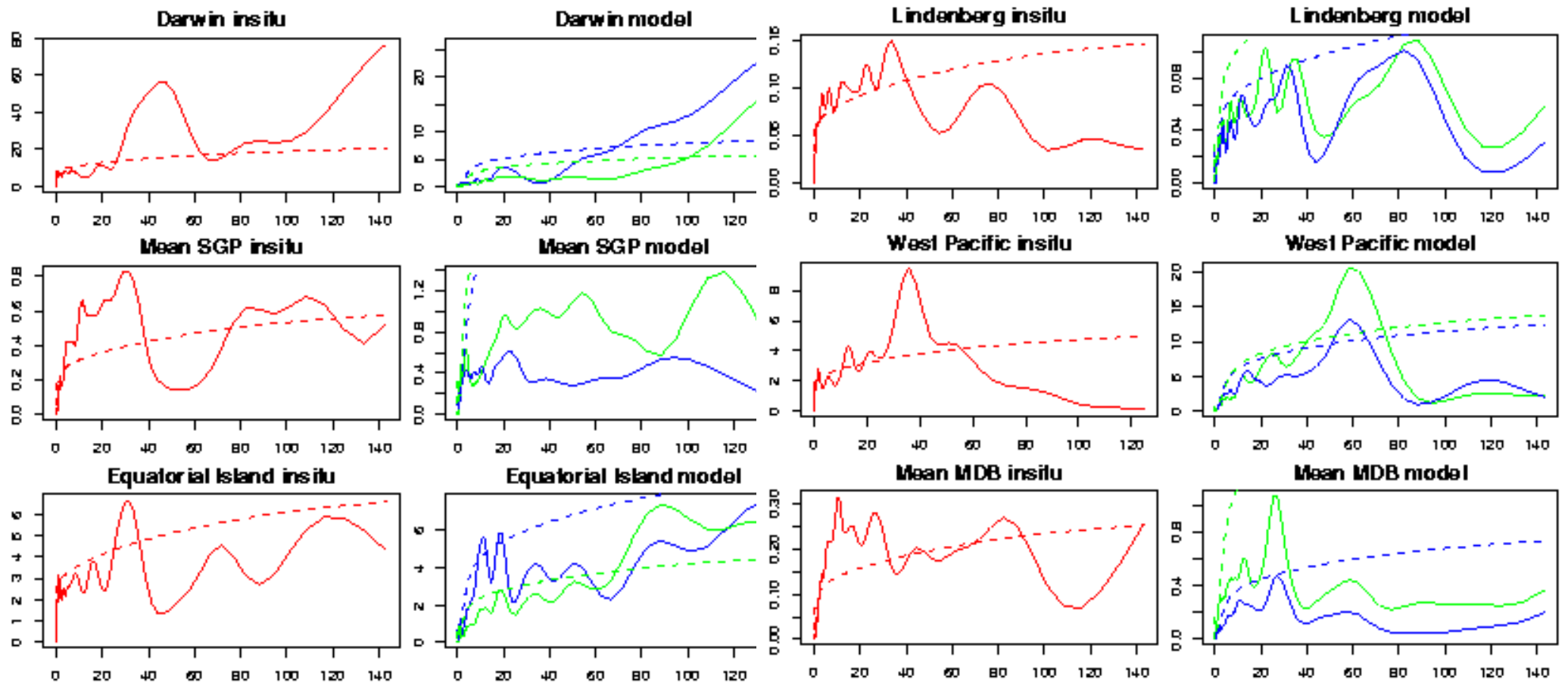
*** Statistics for MONTHLY MEANS

Diurnal variation of Precipitation

Bin average method



Global wavelet spectrum for Precipitation



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Conclusions

- ? Standard formats – standard tools/scripts
 - NetCDF -> cdat, R, python
- ? Station metadata crucial
 - e.g. Drizzle, wet pressure at Darwin
- ? Site matching important!
 - SST influence, elevation etc
- ? Most fields 'look similar'
 - What does this mean in terms of sub-grid scale distributions and assumptions?
- ? Precipitation
 - Not 'similar'
 - not suitable for linear time series tools