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Level-2 Standard Rainrate Profile Algorithms

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Key Questions

- Evolution of TRMM rain products from V4 to V6
- Convergence of V6 rain products
- Convective and stratiform rain distributions

Results are based on TRMM Rain Products Version 6 – V110 (Feb'98)

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Standard TRMM Rain Algorithm Naming Conventions

Level 2

2A-12: TRMM Microwave Imager (TMI-only) rainrate algorithm

2A-25: Precipitation Radar (PR-only) rainrate algorithm

2B-31: Combined (TMI/PR) rainrate algorithm

Level 3

3A-11: Ocean-climate (TMI-only) 5-deg/monthly rainmap algorithm

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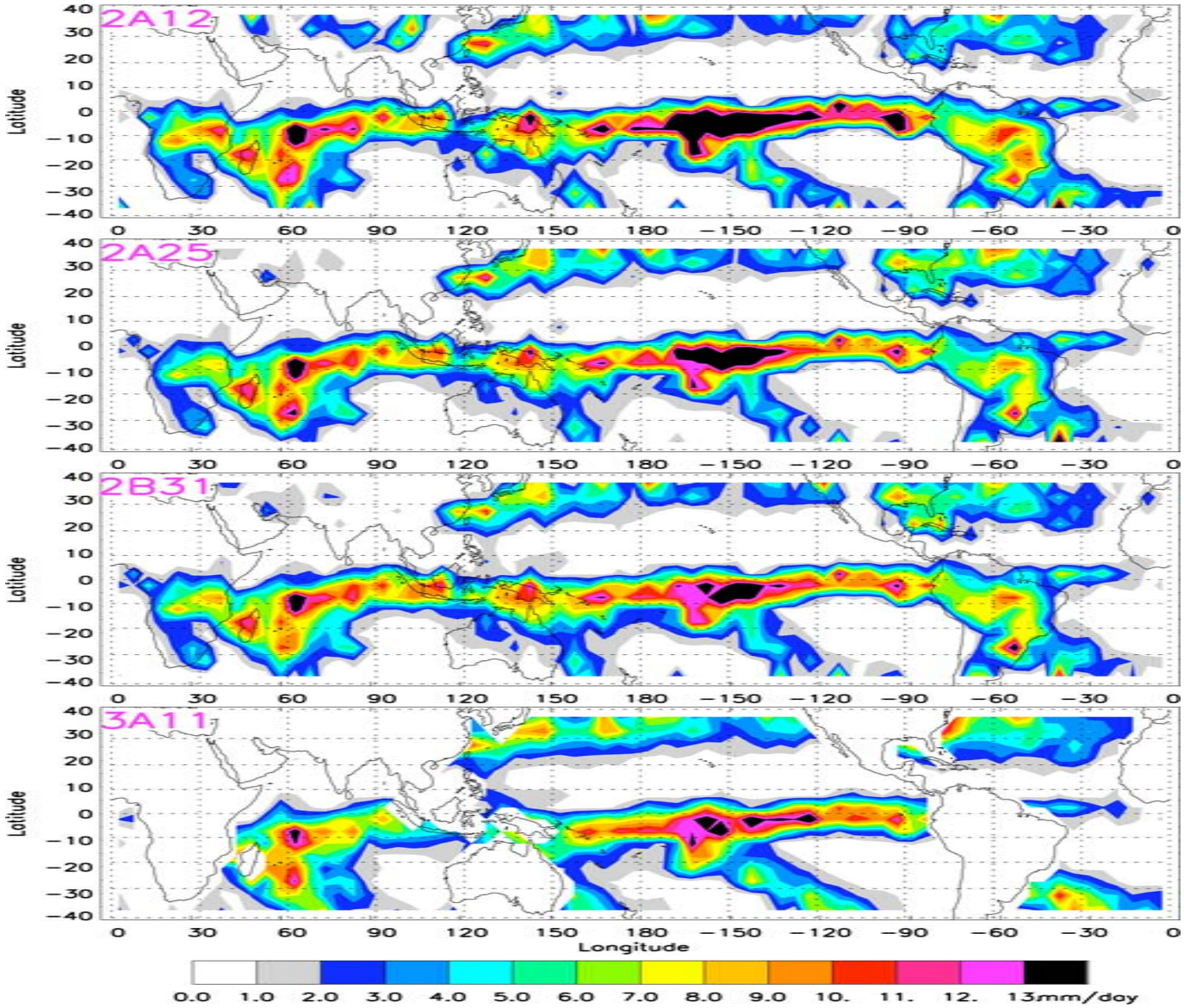
Feb'98 Mean Surface Rainfall
(5 deg grid resolution)



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Evolution from V4 to V6

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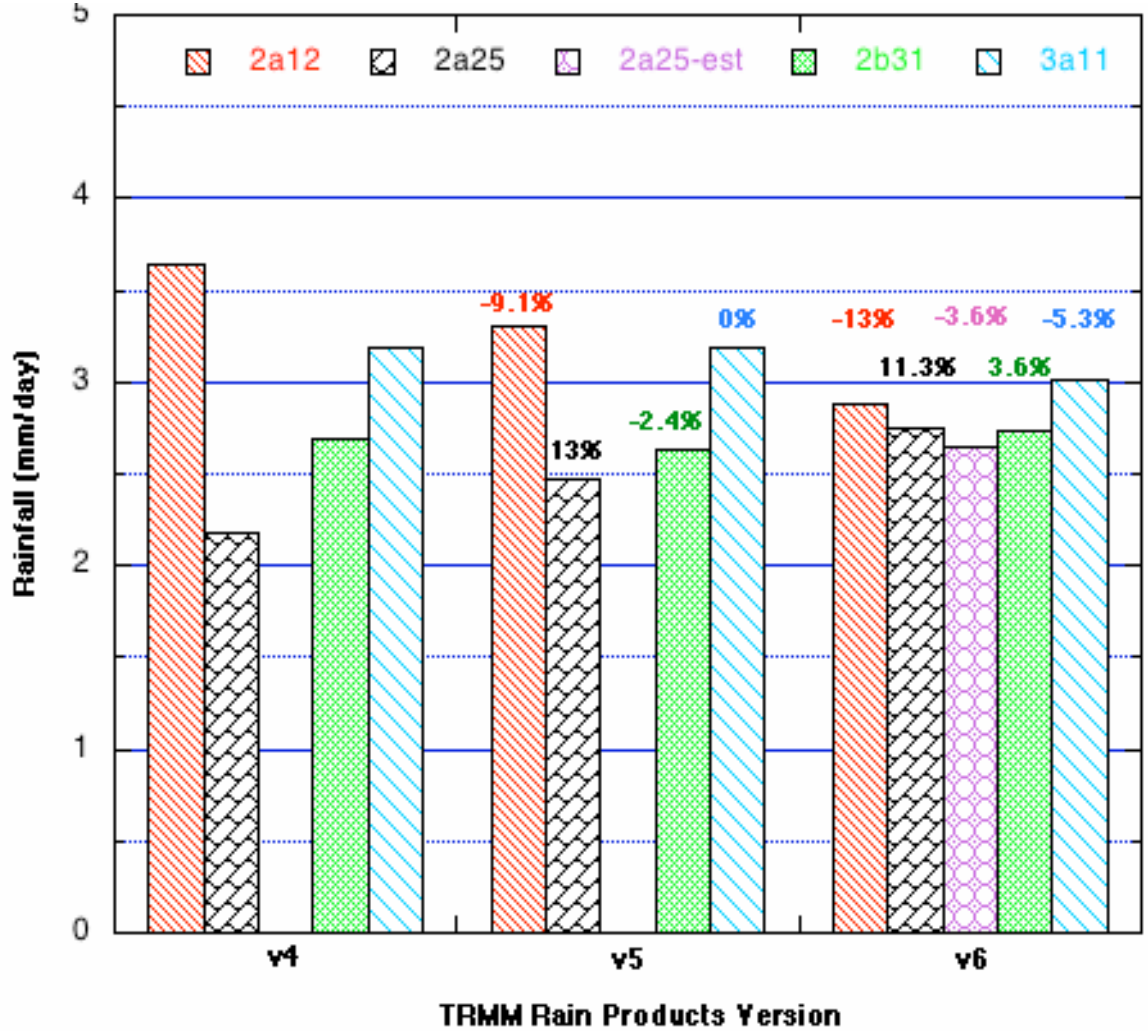
Evolution of TRMM Oceanic Monthly Rainfall (Feb'98; 35°S - 35°N)



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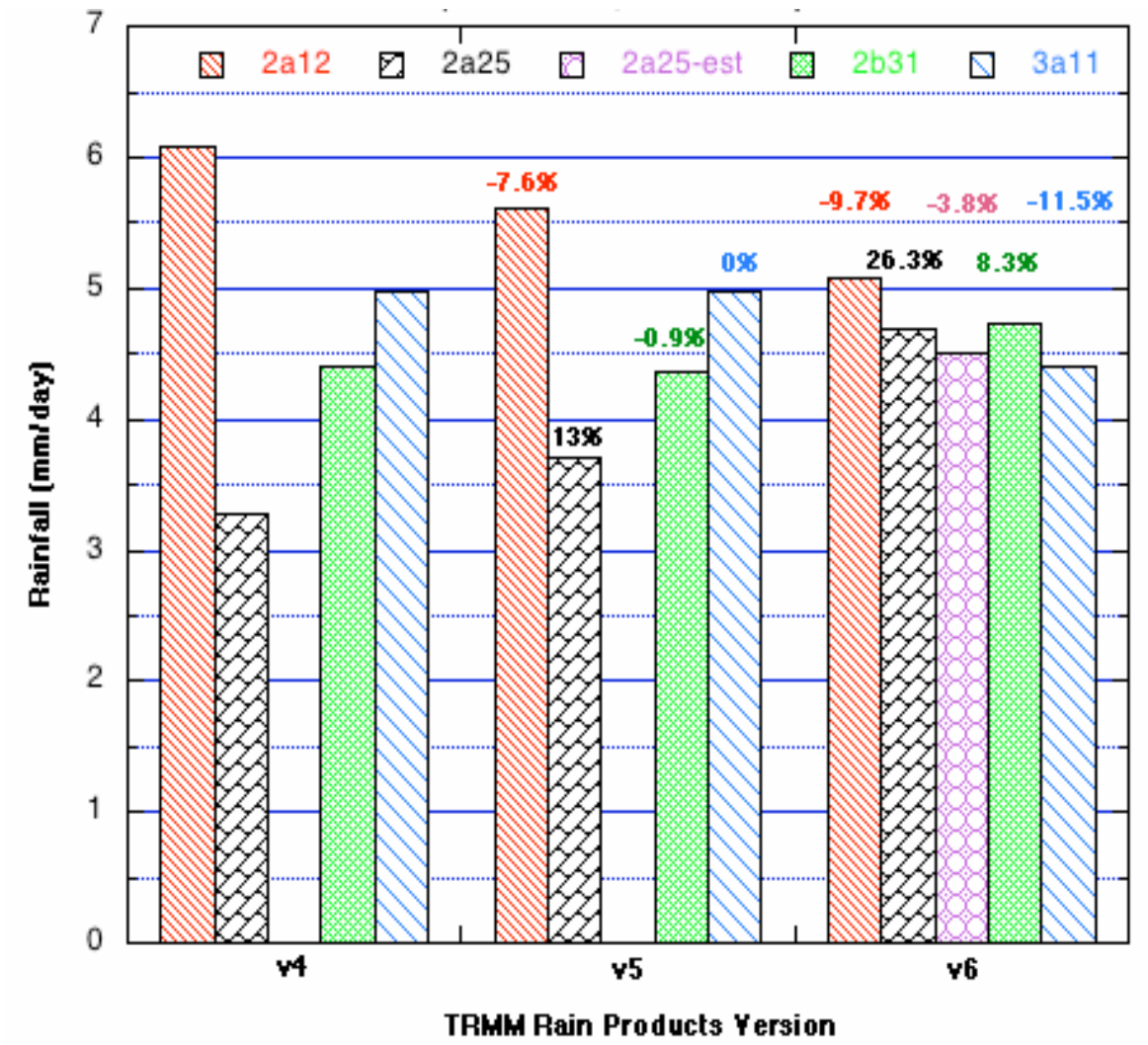
Evolution of TRMM Oceanic Monthly Rainfall (Feb'98; 10°S - 10°N)



Averaging Effects Summary for Oceanic Monthly Rainfall (Feb'98)

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					Mean Rainrate (mm day^{-1})				Rainrate Ratio		
					2a12	2a25	2b31	3a11	2a12/2a25	2a12/2b31	2a12/3a11
Version 5	All Grids	3A11 Sea Flag		RR	3.063	2.425	2.464	N/A	1.26	1.24	N/A
			0.5°	WW	3.170	2.209	2.419	N/A	1.44	1.31	N/A
				RW	3.174	2.210	2.360	N/A	1.44	1.34	N/A
			5°	WW	3.296	2.464	2.677	3.189	1.34	1.23	1.03
				RW	3.302	2.469	2.625	3.189	1.34	1.26	1.04
		2A12 Sea Flag		RR	3.053	2.415	2.448	N/A	1.26	1.25	N/A
			0.5°	WW	3.160	2.206	2.410	N/A	1.43	1.31	N/A
				RW	3.163	2.208	2.351	N/A	1.43	1.35	N/A
			5°	WW	3.285	2.467	2.709	N/A	1.33	1.21	N/A
				RW	3.288	2.475	2.678	N/A	1.33	1.23	N/A
	Matched Grids	3A11 Sea Flag		RR	3.155	2.325	2.495	N/A	1.36	1.26	N/A
			0.5°	WW	3.186	2.344	2.504	N/A	1.36	1.27	N/A
				RW	3.186	2.344	2.503	N/A	1.36	1.27	N/A
			5°	WW	3.308	2.464	2.686	3.189	1.34	1.23	1.04
				RW	3.308	2.469	2.634	3.189	1.34	1.26	1.04
		2A12 Sea Flag		RR	3.147	2.329	2.491	N/A	1.35	1.26	N/A
			0.5°	WW	3.172	2.344	2.496	N/A	1.35	1.27	N/A
				RW	3.172	2.344	2.495	N/A	1.35	1.27	N/A
			5°	WW	3.295	2.481	2.736	N/A	1.33	1.20	N/A
				RW	3.295	2.490	2.706	N/A	1.32	1.22	N/A
Version 6	All Grids	3A11 Sea Flag		RR	2.822	2.739	2.709	N/A	1.03	1.04	N/A
			0.5°	WW	2.909	2.543	2.659	N/A	1.14	1.09	N/A
				RW	2.921	2.599	2.628	N/A	1.12	1.11	N/A
			5°	WW	2.902	2.733	2.840	3.019	1.06	1.02	0.96
				RW	2.914	2.795	2.813	3.019	1.04	1.04	0.97
		2A12 Sea Flag		RR	2.810	2.718	2.688	N/A	1.03	1.05	N/A
			0.5°	WW	2.895	2.532	2.646	N/A	1.14	1.09	N/A
				RW	2.907	2.587	2.615	N/A	1.12	1.11	N/A
			5°	WW	2.882	2.690	2.820	N/A	1.07	1.02	N/A
				RW	2.892	2.748	2.807	N/A	1.05	1.03	N/A
	Matched Grids	3A11 Sea Flag		RR	2.949	2.789	2.791	N/A	1.06	1.05	N/A
			0.5°	WW	2.967	2.801	2.791	N/A	1.06	1.06	N/A
				RW	2.967	2.801	2.790	N/A	1.06	1.06	N/A
			5°	WW	2.876	2.750	2.730	3.019	1.05	1.05	0.95
				RW	2.878	2.749	2.729	3.019	1.05	1.05	0.95
		2A12 Sea Flag		RR	2.934	2.781	2.283	N/A	1.06	1.05	N/A
			0.5°	WW	2.948	2.789	2.778	N/A	1.06	1.06	N/A
				RW	2.948	2.789	2.777	N/A	1.06	1.06	N/A
			5°	WW	2.847	2.708	2.745	N/A	1.05	1.04	N/A
				RW	2.849	2.708	2.744	N/A	1.05	1.04	N/A

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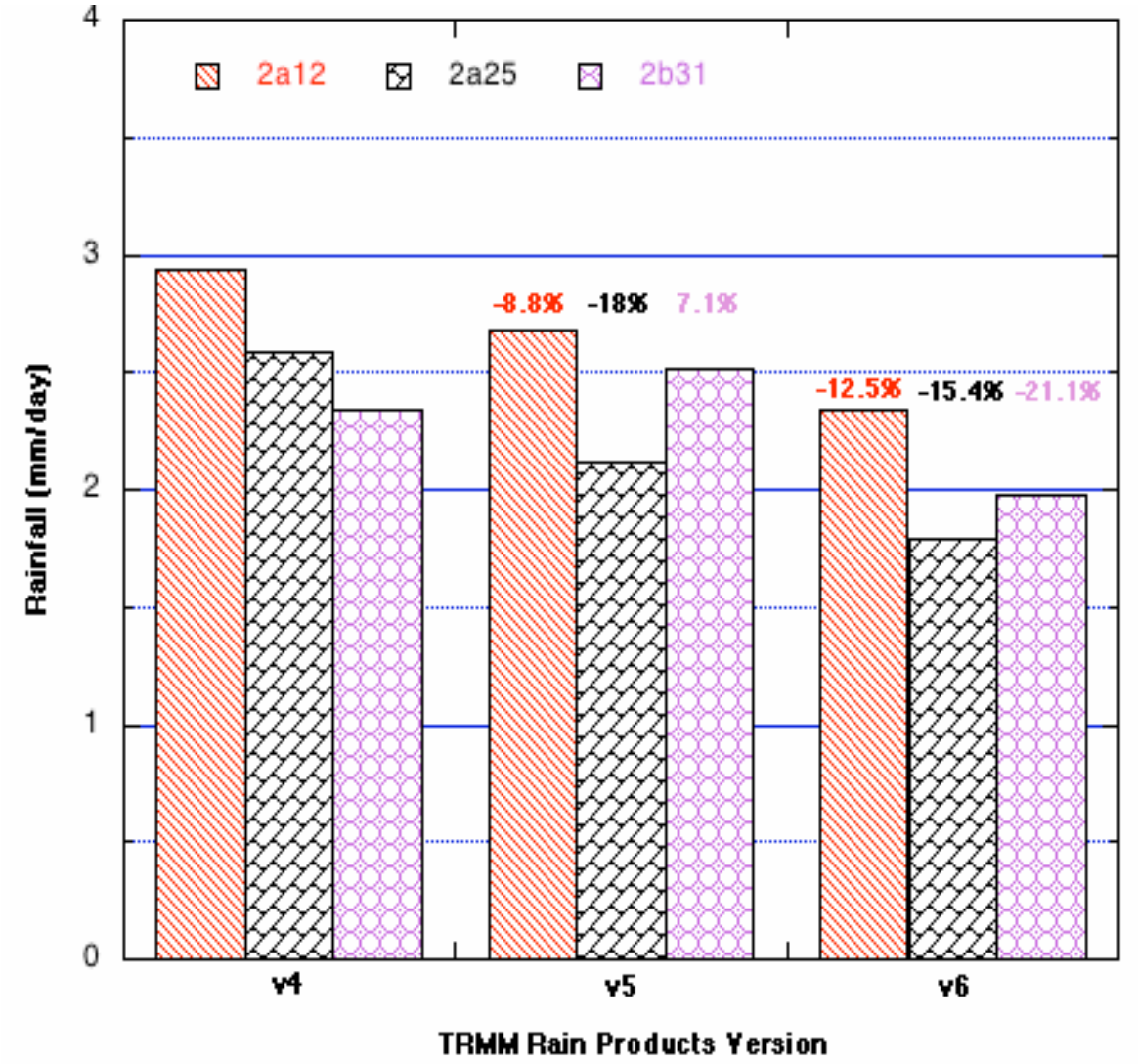
Evolution of TRMM Continental Monthly Rainfall (Feb'98; 35°S - 35°N)



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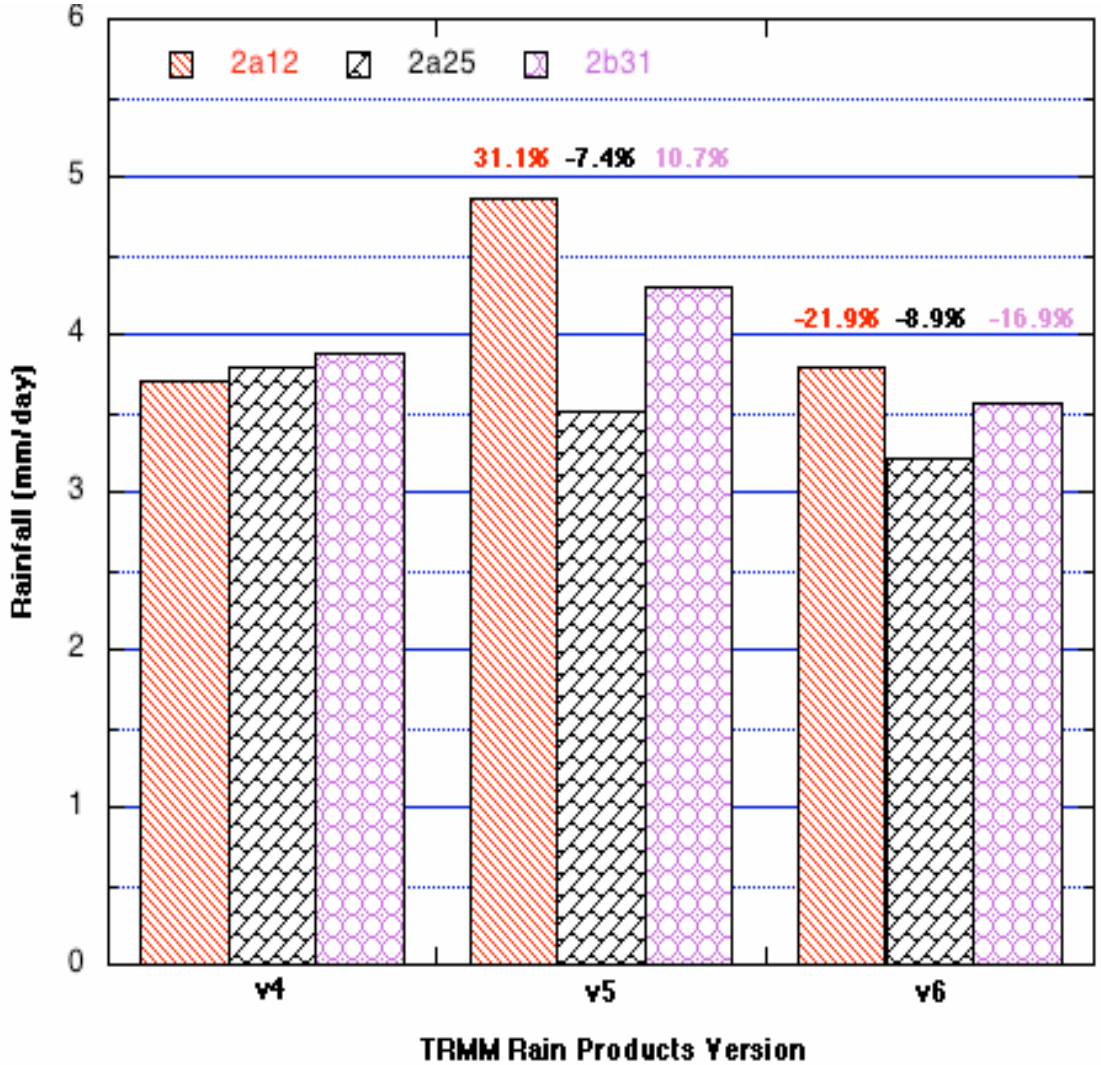
Evolution of TRMM Continental Monthly Rainfall (Feb'98; 10°S - 10°N)



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Zonal Distributions

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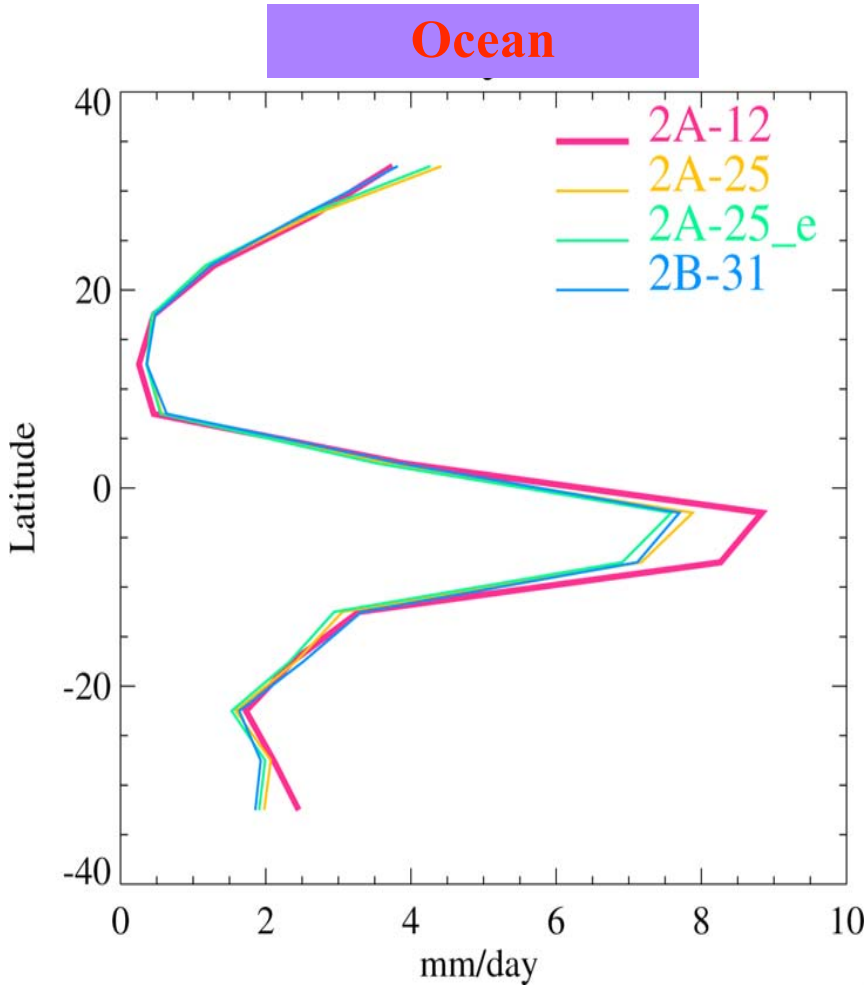
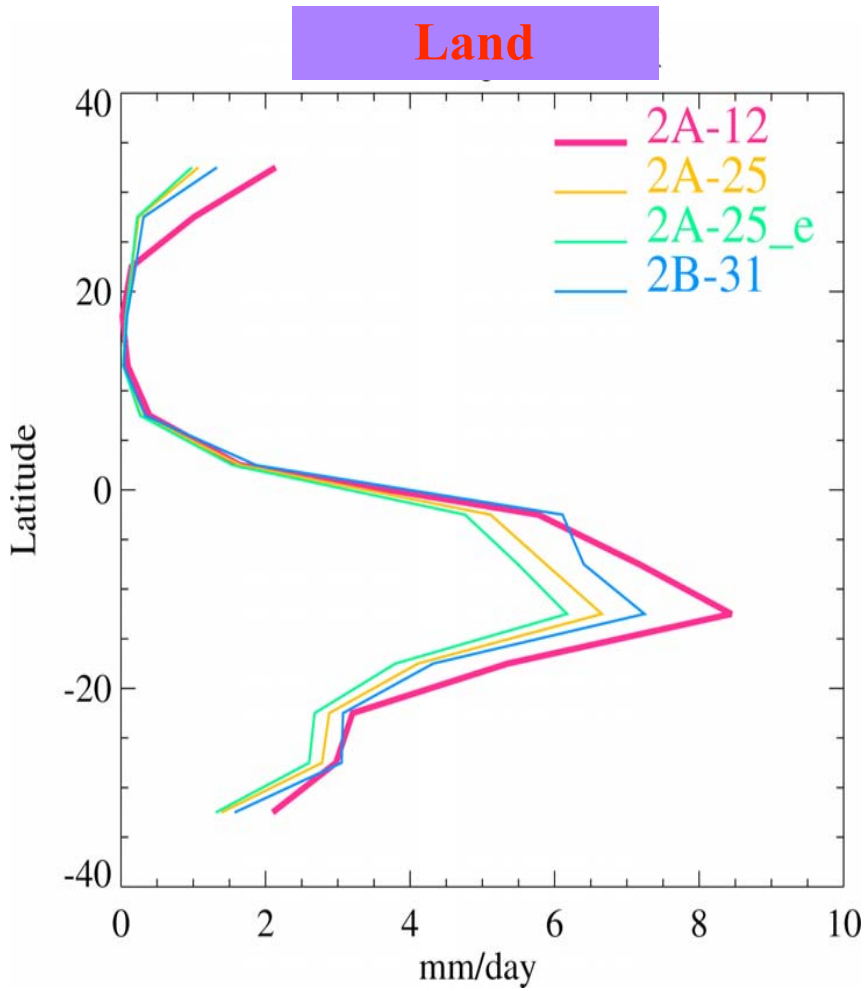
Zonal-Monthly Mean Surface Rainrates from Matched Algorithms (Feb'98 --- 5 deg latitude bands)





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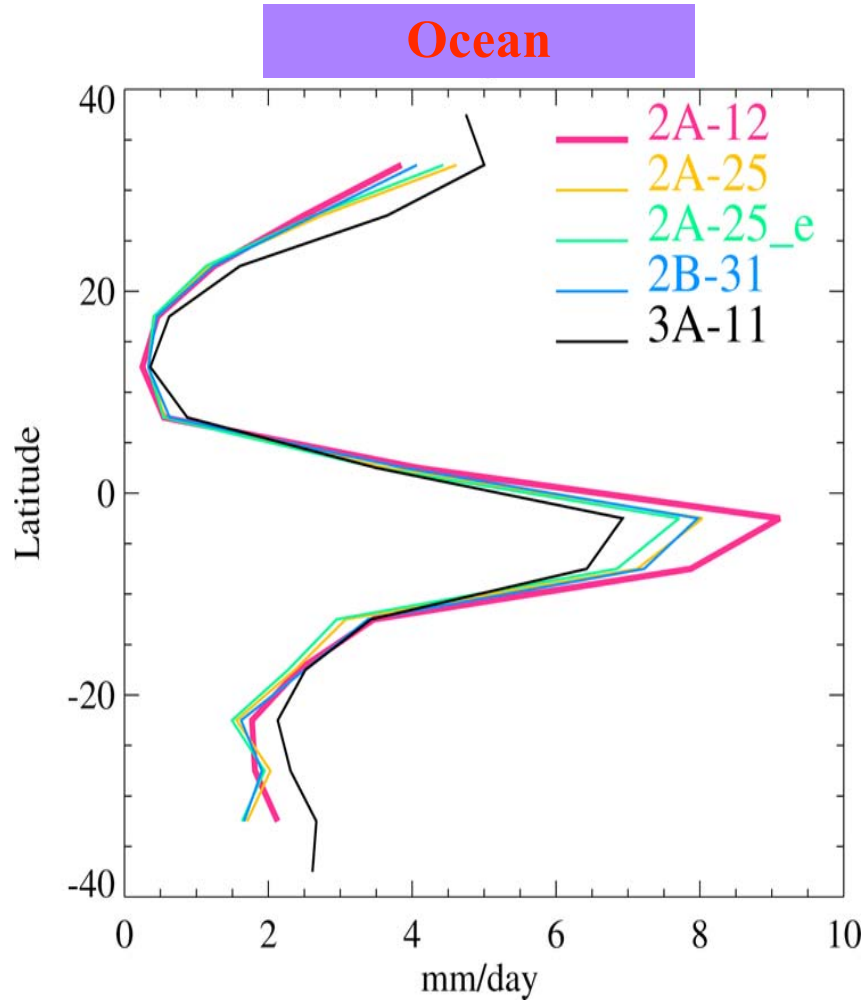
Zonal-Monthly Mean Oceanic Surface Rainrates (Feb'98 -- 5 deg latitude bands)



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Convective Rain Distributions

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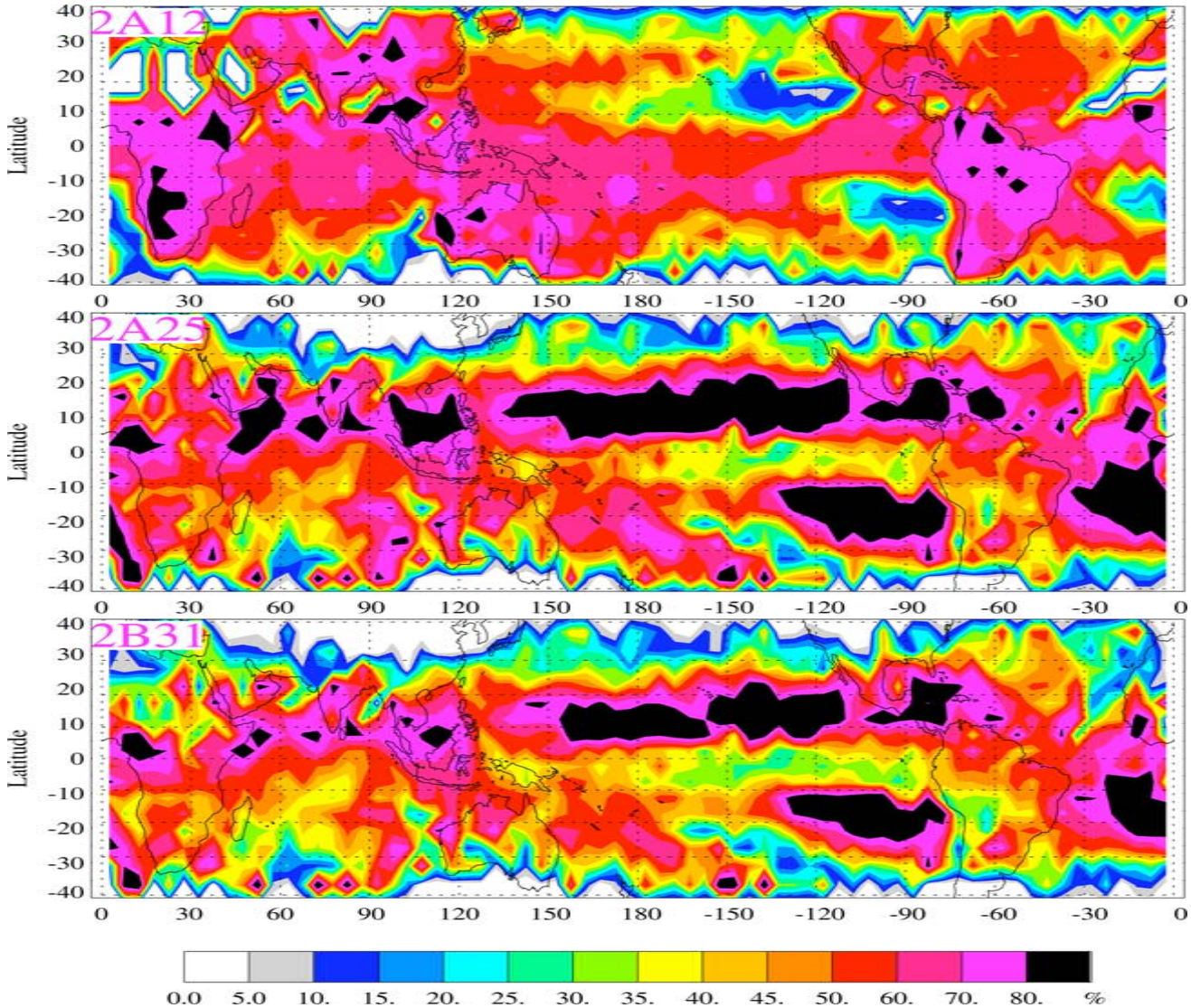
Feb'98 Mean Surface Convective Rain Percentage
(5 deg resolution)



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Summary & Conclusions

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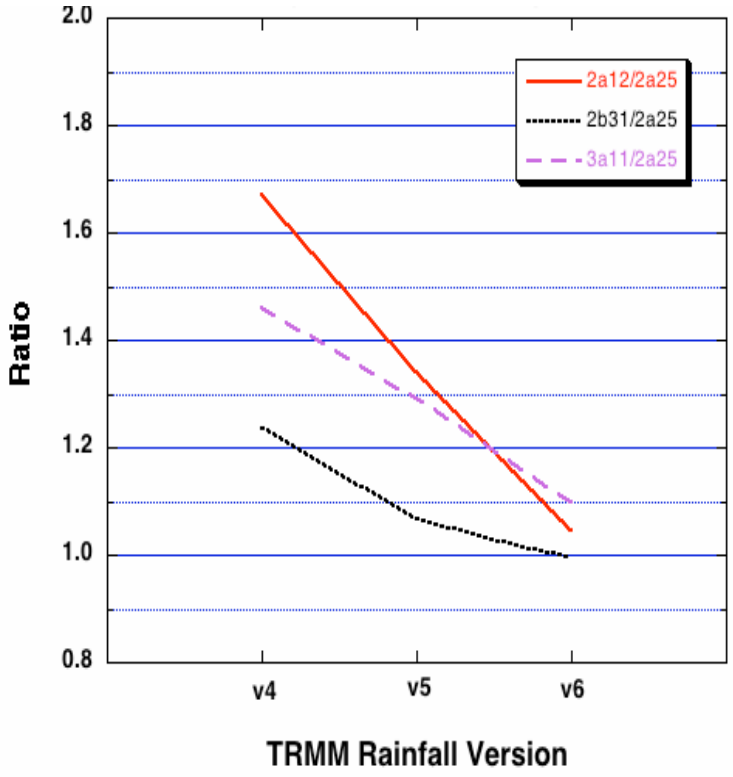
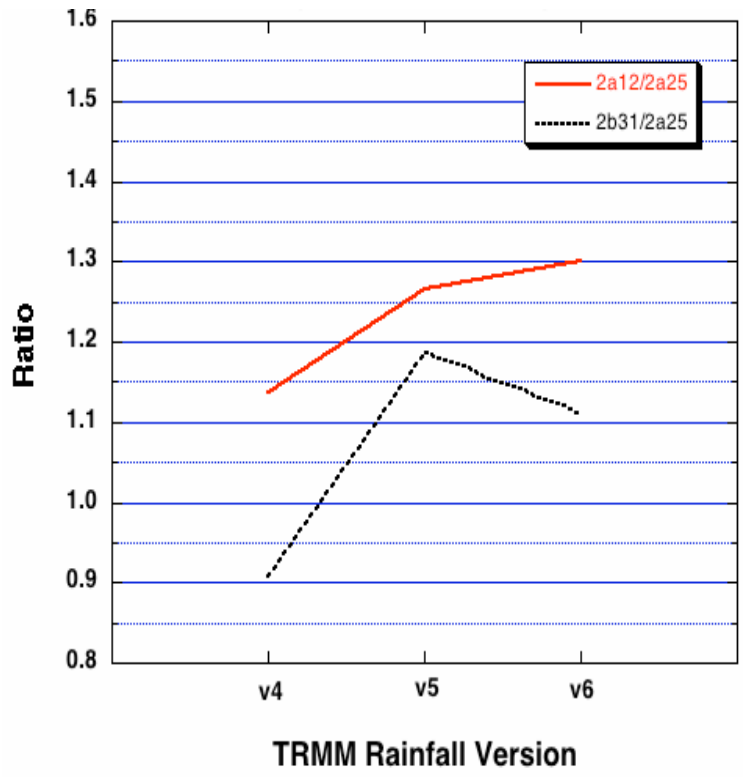
Evolution of Mean Monthly Rainfall Ratio Against PR (Feb'98, 35°S - 35°N)

Ocean



Land



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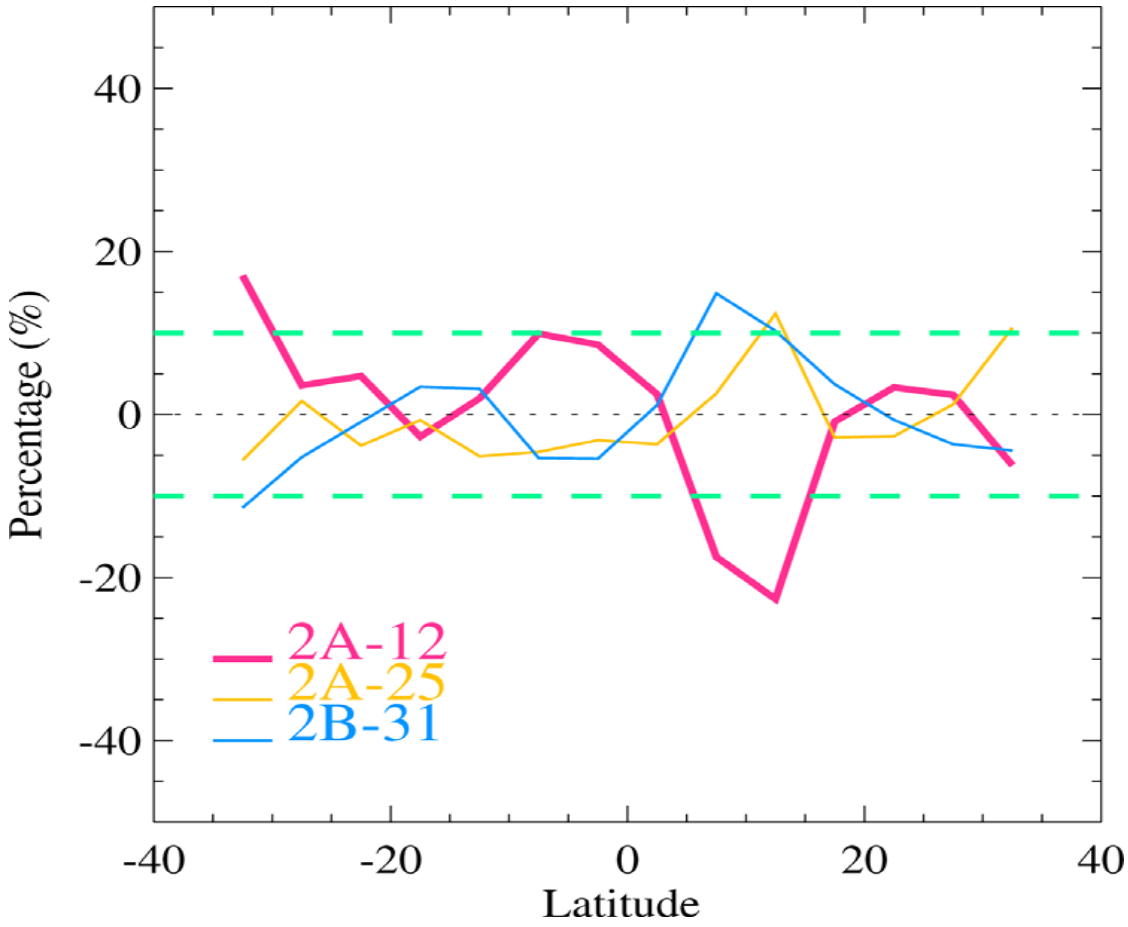
Feb'98 Zonal Mean Differences Relative to 3-Algorithm Composite

Ocean



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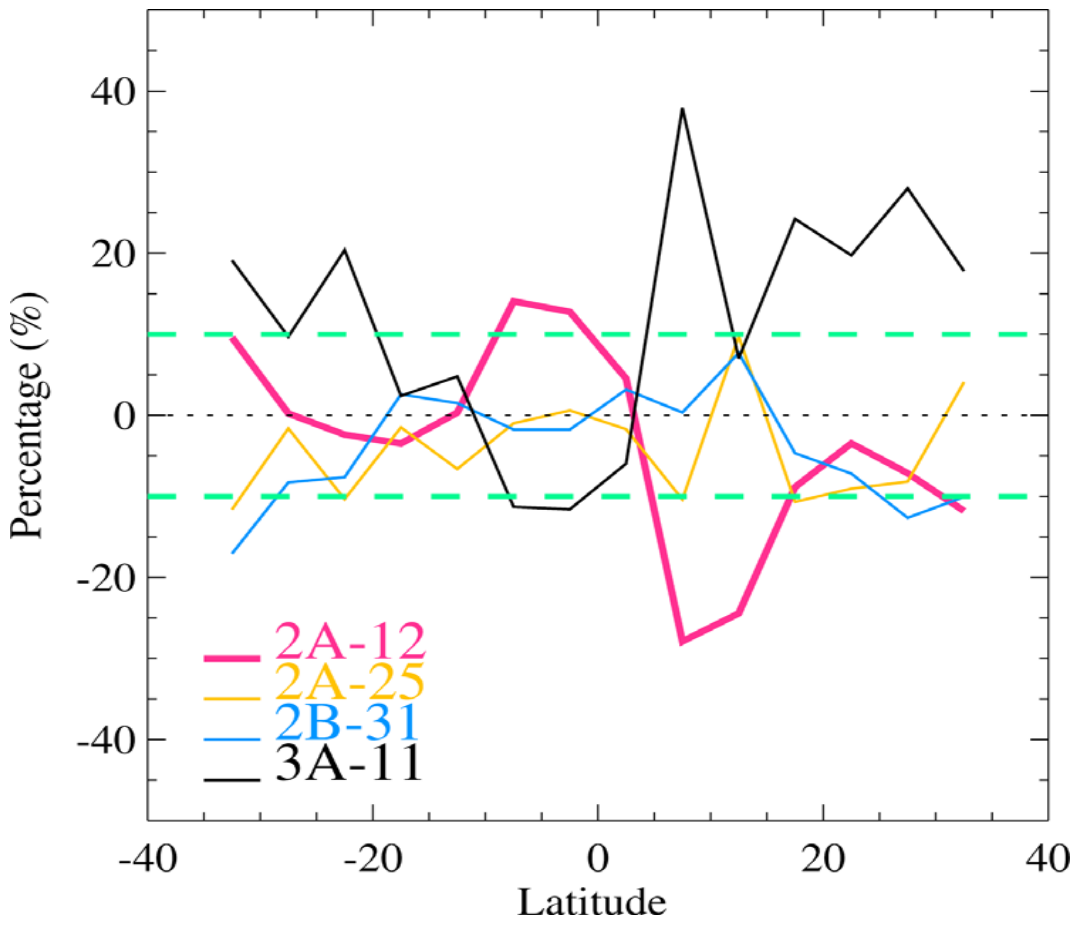
Feb'98 Zonal Mean Differences Relative to 4-Algorithm Composite



Conclusions

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- *V4 to V6 Evolution:*
  - ***Oceanic Monthly Rainfall:***
    - **for entire global tropics & subtropics: (i) 2A-12 (2A-25) progressively decreases (increases); (ii) 2B-31 & 3A-11 remain relatively stationary => very good agreement!**
    - **for deep tropics: (i) 2A-25 progressively increases but with significant V5 to V6 differences wrt entire global tropics-subtropics behavior; (ii) 2B-31 (3A-11) now undergoes sizeable V5 to V6 increase (decrease) wrt entire global tropics-subtropics behavior =>good agreement with some differences**
  - ***Continental Monthly Rainfall:***
    - **for entire global tropics & subtropics: (i) 2A-12 & 2A-25 progressively decreases; (ii) 2B-31 decreases dramatically from v5 to v6. => good agreement**
    - **for deep tropics: (i) 2A-12 & 2B-31 increase from v4-v5 while decrease from v5-v6; (ii) 2A-25 progressively decreases. => good agreement**
- *V6 Algorithm Convergence:*
  - **Oceanic convergence in v6 algorithms has increased wrt v5 (basically within 10%)**
  - **Continental convergence in v6 algorithms is still in 20%.**
- *Convective/Stratiform Distributions:*
  - **2A-25 & 2B-31 are in very good agreement. (i) There are 50-80% of rain are convective in light rain regions; (ii) Only 30-45% of rain are convective in heavy rain regions.**
  - **Behavior of 2A-12 convective rainfall is quite different from 2A-25/2B-31. It appears that 2A-12 convective rain contribution is too strong.**