



***ISCCP Weather States and MODIS Cloud Regimes:
Organizing passive cloud observations for
understanding the nature of global cloudiness***

[Lazaros Oreopoulos \(NASA-GSFC\)](#)

With help by:

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Jackson Tan (USRA-NPP/NASA)

and

Bill Rossow

Bill



Vol. 15, No. 6

JOURNAL OF CLIMATE

15 MARCH 2002

12 mentions of Oreopoulos and Davies 1998a,b

**Implications of the Observed Mesoscale Variations of Clouds for the Earth's
Radiation Budget**

WILLIAM B. ROSSOW

NASA Goddard Institute for Space Studies, New York, New York

CARL DELO AND BRIAN CAIRNS

Applied Physics and Mathematics, Columbia University at NASA Goddard Institute for Space Studies, New York, New York

(Manuscript received 30 May 2001, in final form 7 September 2001)

Soak up the sun on Buzios' beaches



18th Meeting of GEWEX GRP
Buzios, Brazil, 9-12 October 2007



A satellite image of Earth showing cloud cover over the North Atlantic and surrounding regions. The clouds are depicted as white and light gray patterns against the darker blue of the ocean and the green/brown of the landmasses. The text "Weather States" and "Cloud Regimes" is overlaid in a bold, dark blue font in the center of the image.

Weather States

Cloud Regimes



OF GEOPHYSICAL RESEARCH, VOL. 116, D12202, doi:10.1029/2010JD015472, 2011

Journal of Geophysical Research

Climate Dynamics
January 2017, Volume 48, Issue 1

**Simplified ISCCP
in CMIP5 models**

Authors
Daeho Jin, Lazaros Oreopoulos, Dongmin Lee, Nayeong Cho, George J. Huffman

**Effects of International Satellite Cloud
Categorization on
Cloud Regime States**

Authors
M. B. Rossow^{1,2}, George J. Huffman¹, George J. Huffman¹, George J. Huffman¹

Received 26 March 2011; accepted 26 March 2011; published 17 June 2011

RESEARCH ARTICLE
10.1002/2013JD021409

Key Points:

- Cloud systems observed by passive sensors can be decomposed into cloud regimes
- The regimes have distinct structures

**Objective identification of cloud regimes in the
Tropical Western Pacific**

Christian Jakob¹
Bureau of Meteorology Research Centre, Melbourne, Australia

George Tselioudis
NASA GISS/Columbia University Dept. of Applied Physics, New York, USA

Received 8 August 2003; revised 5 September 2003; accepted 16 September 2003; published 1 November 2003.

RESEARCH LETTER

Climate Dynamics
January 2017, Volume 48, Issue 1

**Regime-based evaluation of
radiative effects of
distinct mesoscale
cloud regimes**

Authors
Lazaros Oreopoulos, Dongmin Lee, Nayeong Cho, George J. Huffman

RESEARCH ARTICLE
10.1002/2015JD024502

**An examination of the nature of global
MODIS cloud regimes**

Lazaros Oreopoulos¹, Nayeong Cho^{1,2}, Dongmin Lee^{1,3}, Seiji Kato⁴, and George J. Huffman¹

¹NASA-GSFC, Earth Science Division, Greenbelt, Maryland, USA, ²USRA, Columbia, Maryland, USA, ³GESTAR, Morgan State University, Baltimore, Maryland, USA, ⁴NASA-LARC, Climate Science Branch, Hampton, Virginia, USA

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**The Precipitation Characteristics of
Tropical Cloud Regimes**

Journal of Geophysical Research
An AGU Journal

Research Article

**Using MODIS cloud regimes to sort diagnostic signals of
aerosol-cloud-precipitation interactions**

Authors
Lazaros Oreopoulos, Dongmin Lee, Nayeong Cho

First published: 20 May 2017
DOI: 10.1002/2016JD026120

RESEARCH ARTICLE
10.1002/2015JD024502

Atmospheres
AN AGU JOURNAL

Atmospheres
AN AGU JOURNAL

Research Article

**Interregional differences in MODIS-derived cloud
regimes**

Authors
Jussi Leinonen, Matthew D. Lebsock, Lazaros Oreopoulos, Nayeong Cho

First published: 1 October 2016
DOI: 10.1002/2016JD025193

JOURNAL OF CLIMATE

JOURNAL OF GEOPHYSICAL RESEARCH
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JOURNAL OF CLIMATE

VOLUME 26

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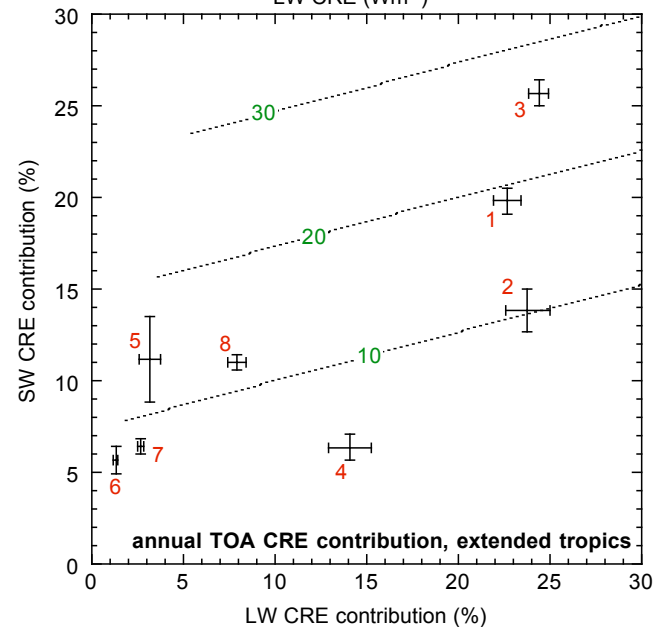
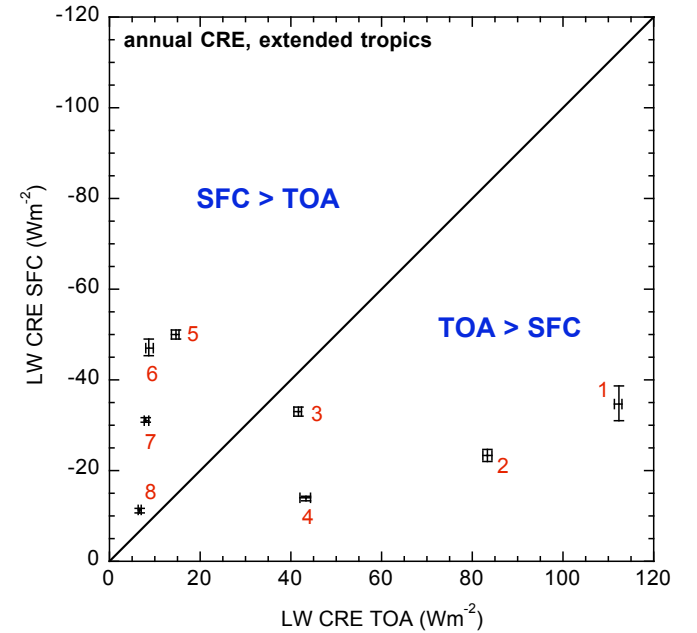
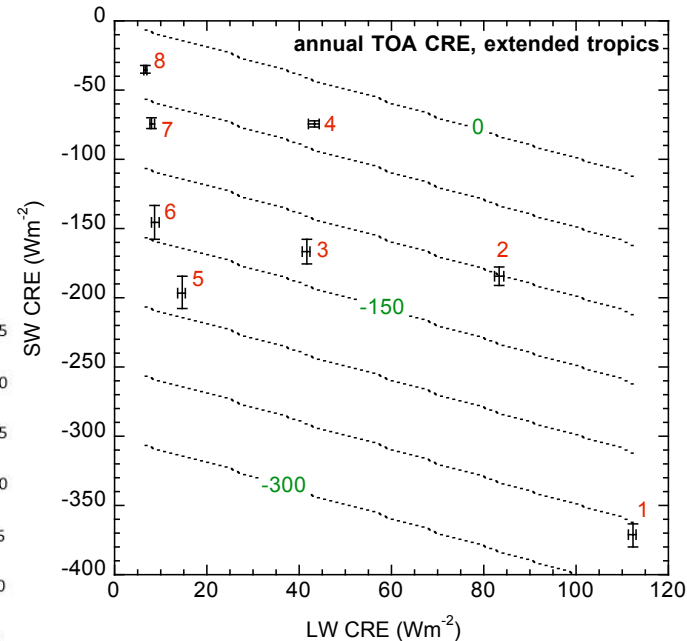
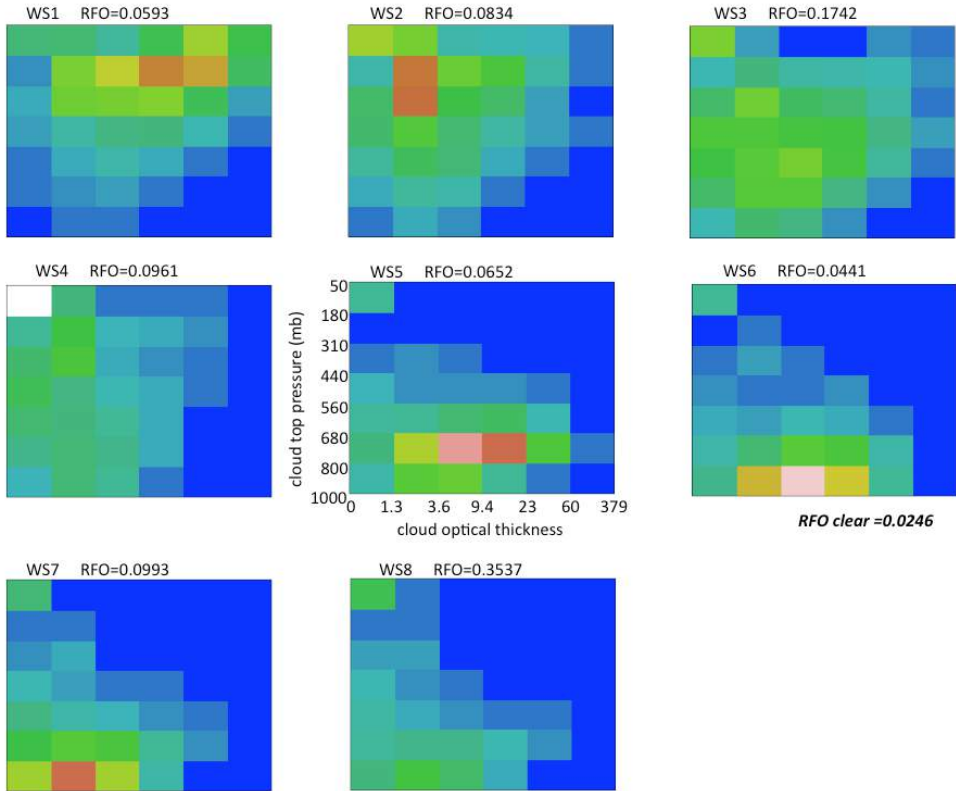
JGR

Explore this journal >

An aerial photograph of a coastline, likely in the Pacific Northwest, showing a mix of dark green forest, sandy beaches, and rocky outcrops. The word "Radiation" is overlaid in a bold, dark blue font in the center of the image.

Radiation

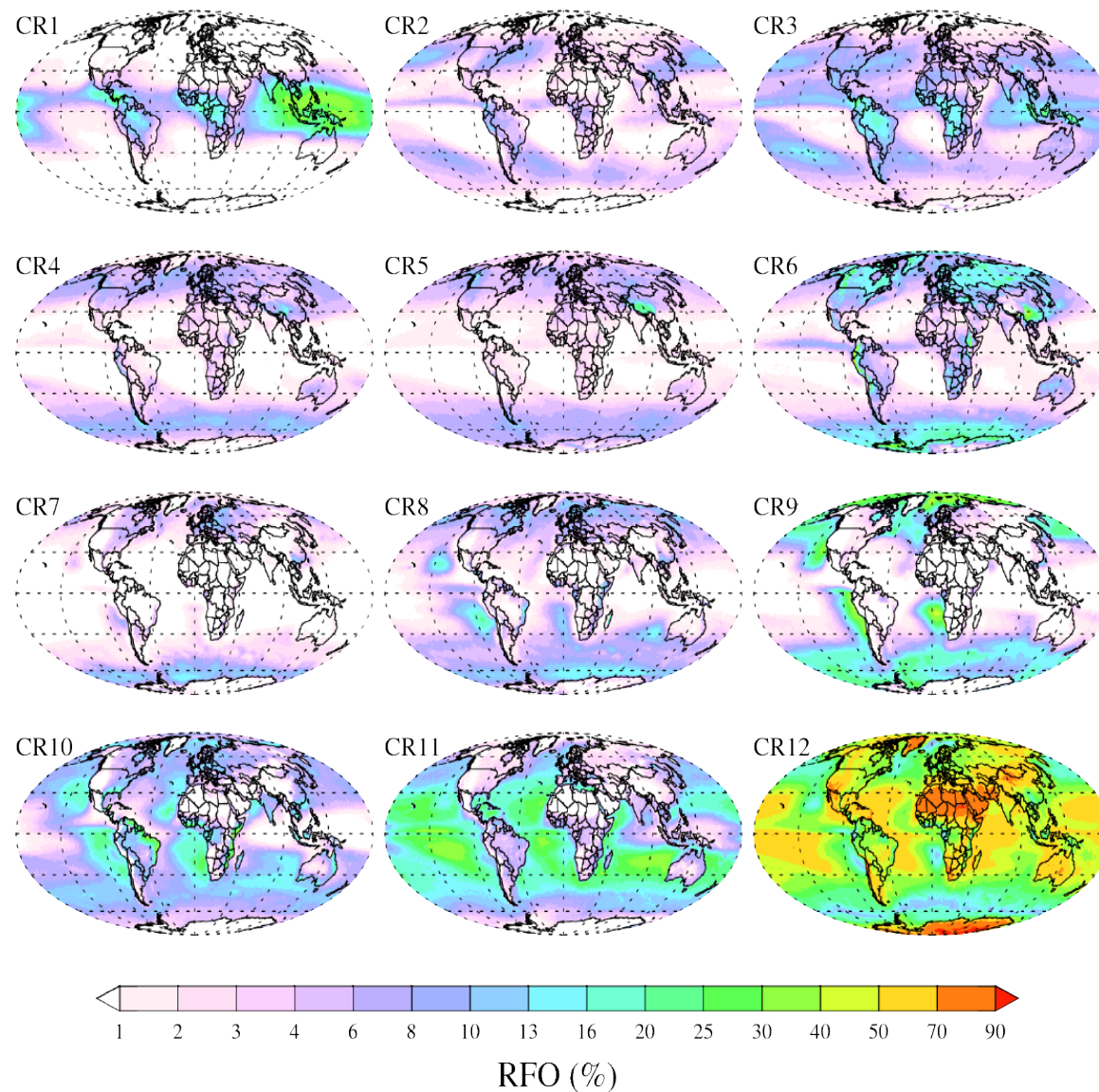
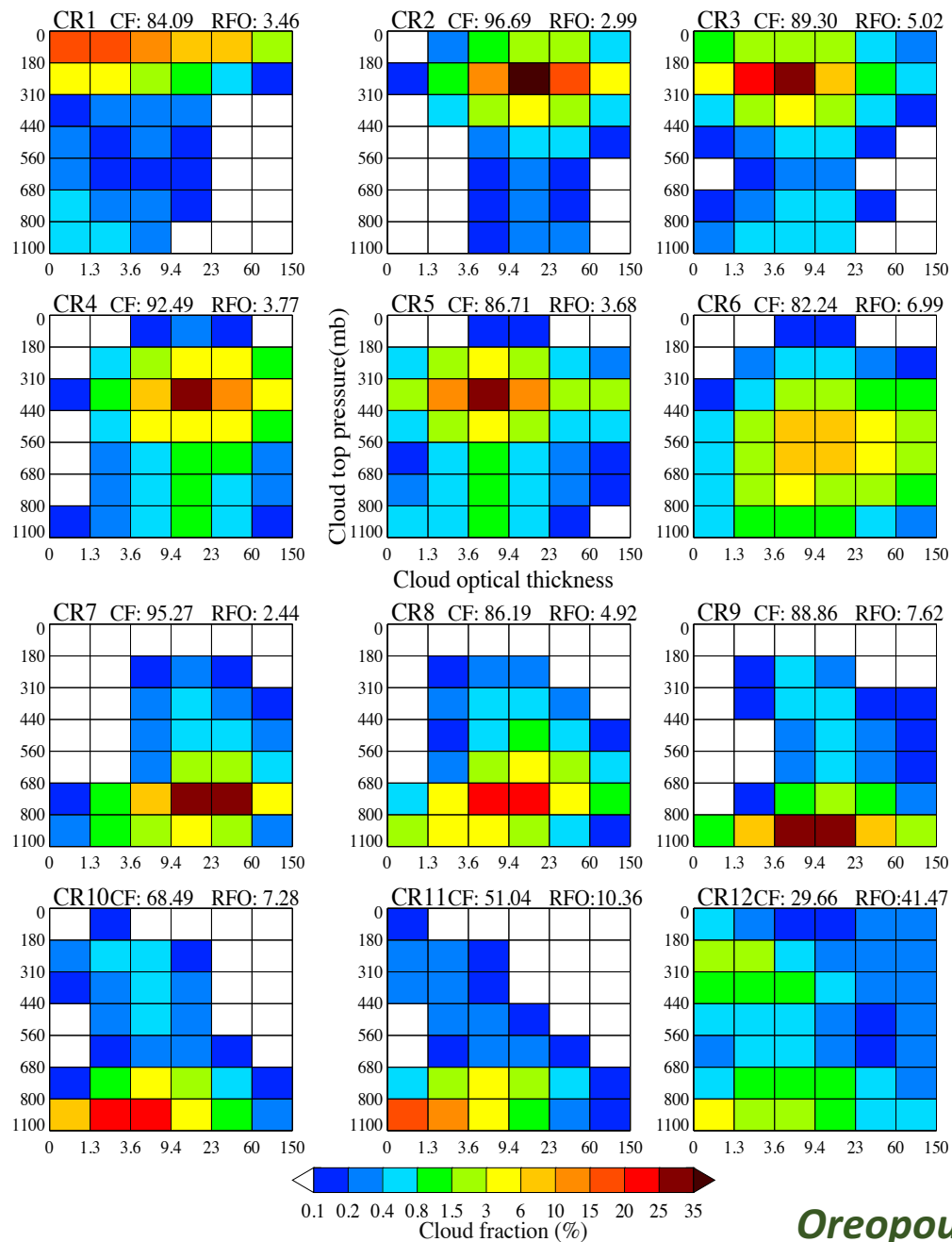
Breakdown of (daytime) CRE by Weather State



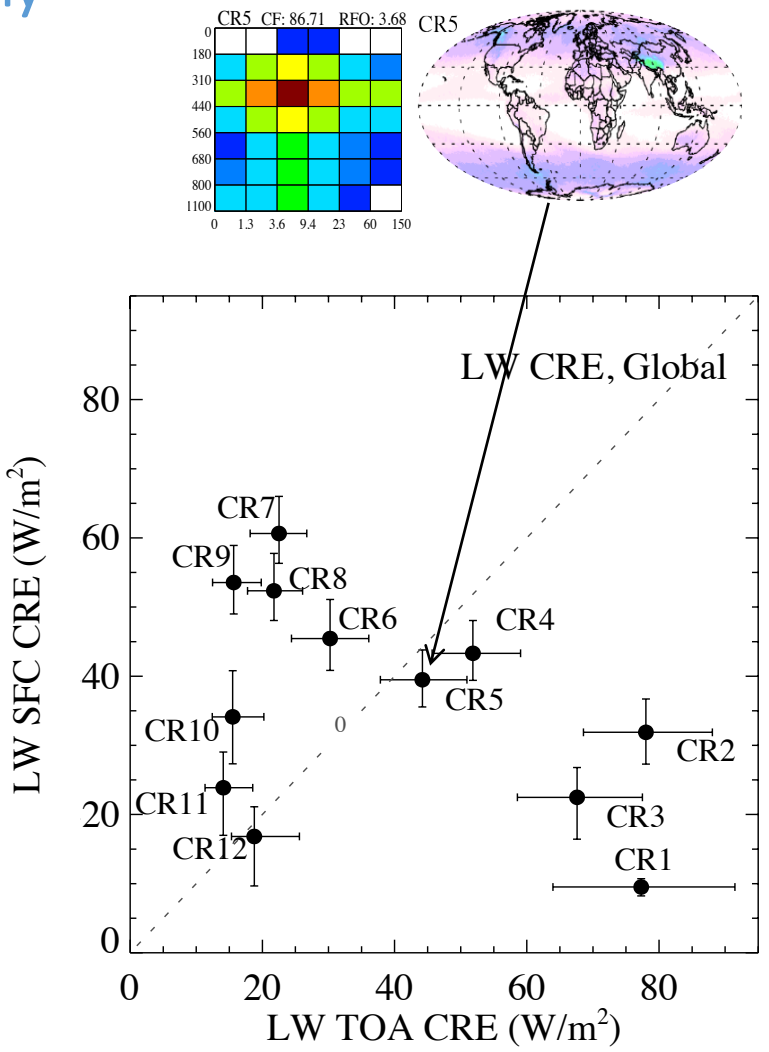
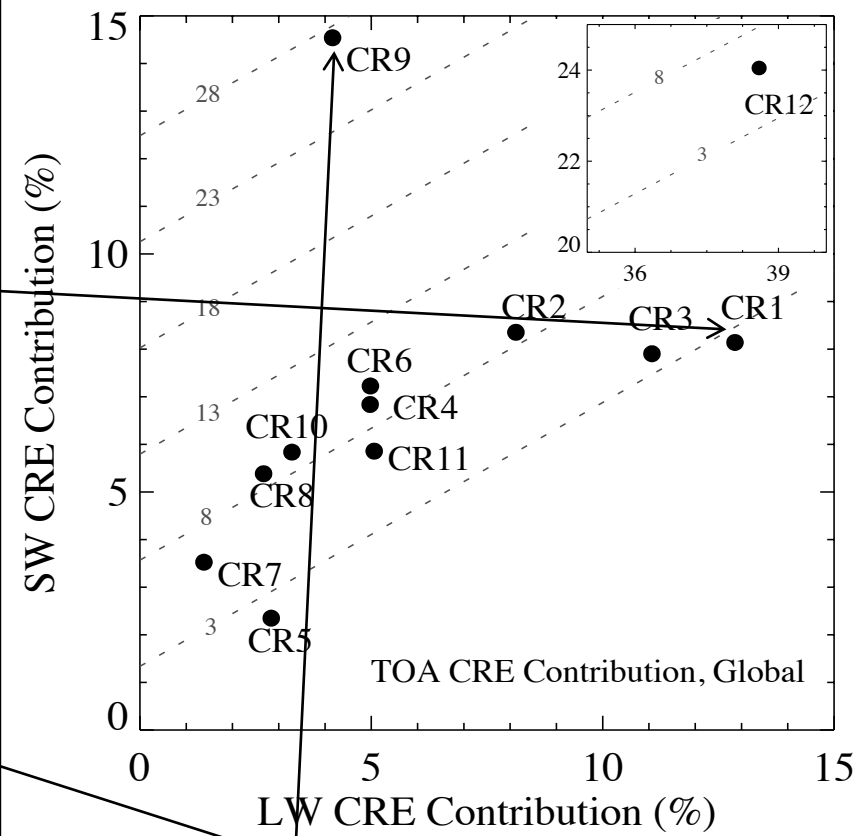
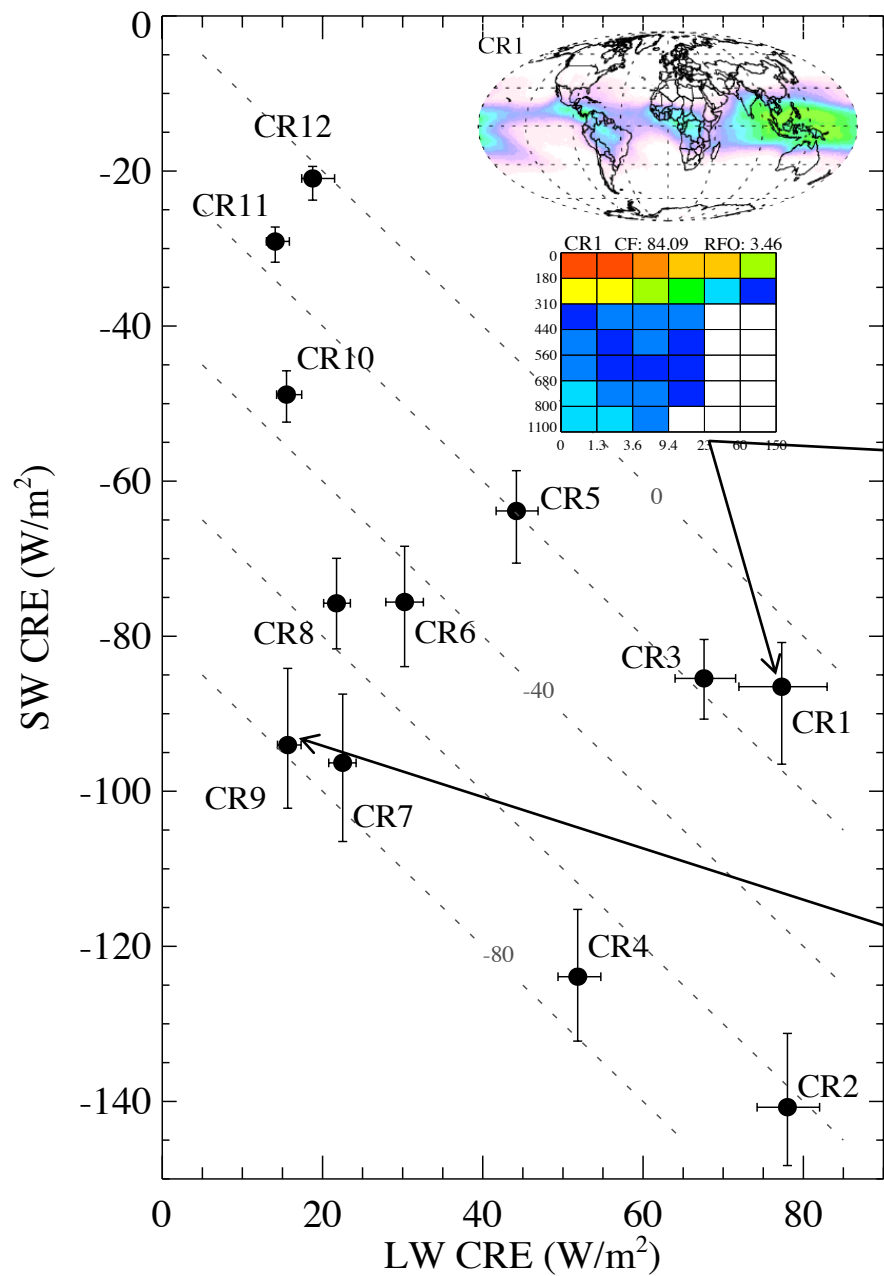
ISCCP extended tropics weather states



MODIS C6 CRs



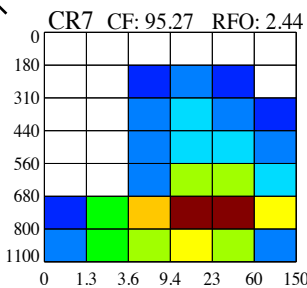
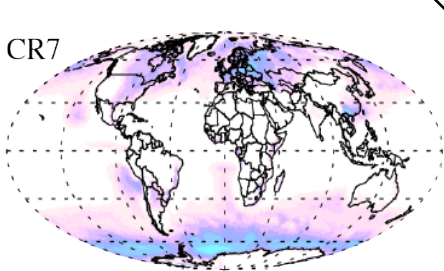
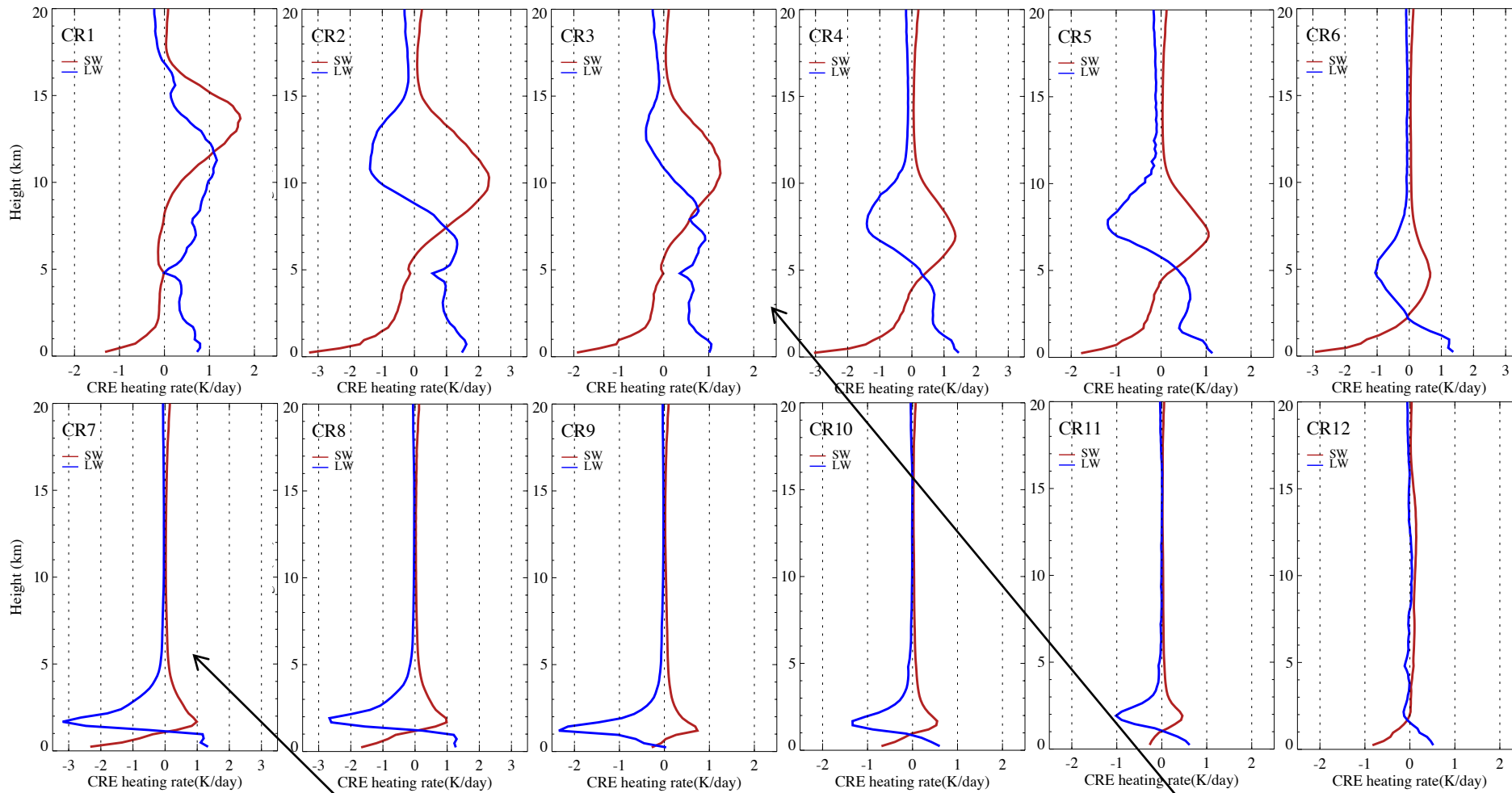
CRE from CERES SYN1deg-daily





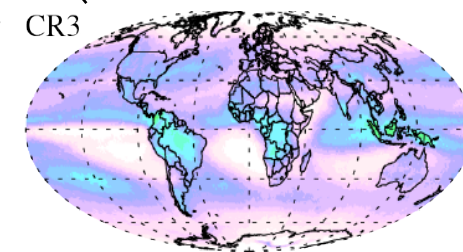
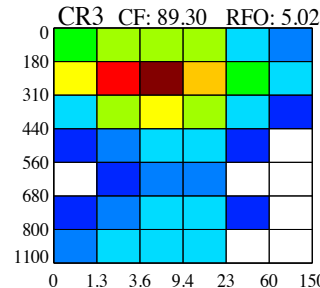
Vertical distribution of cooling and warming (SW and LW)

Oreopoulos et al., JGR, 2016



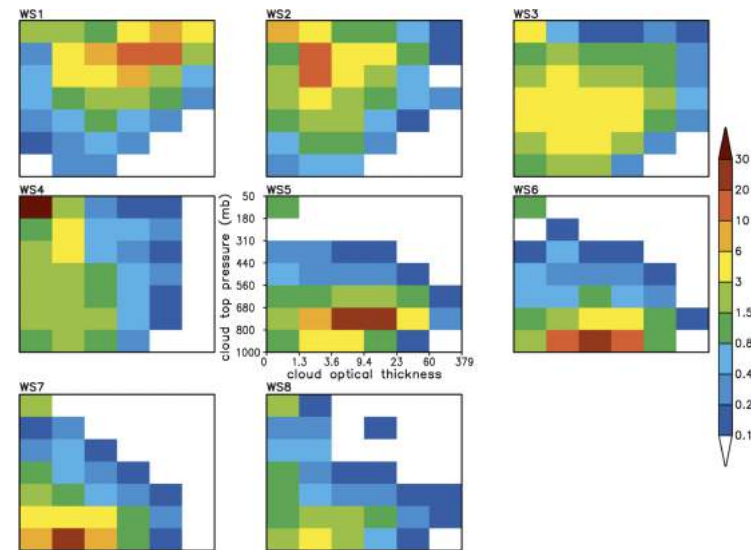
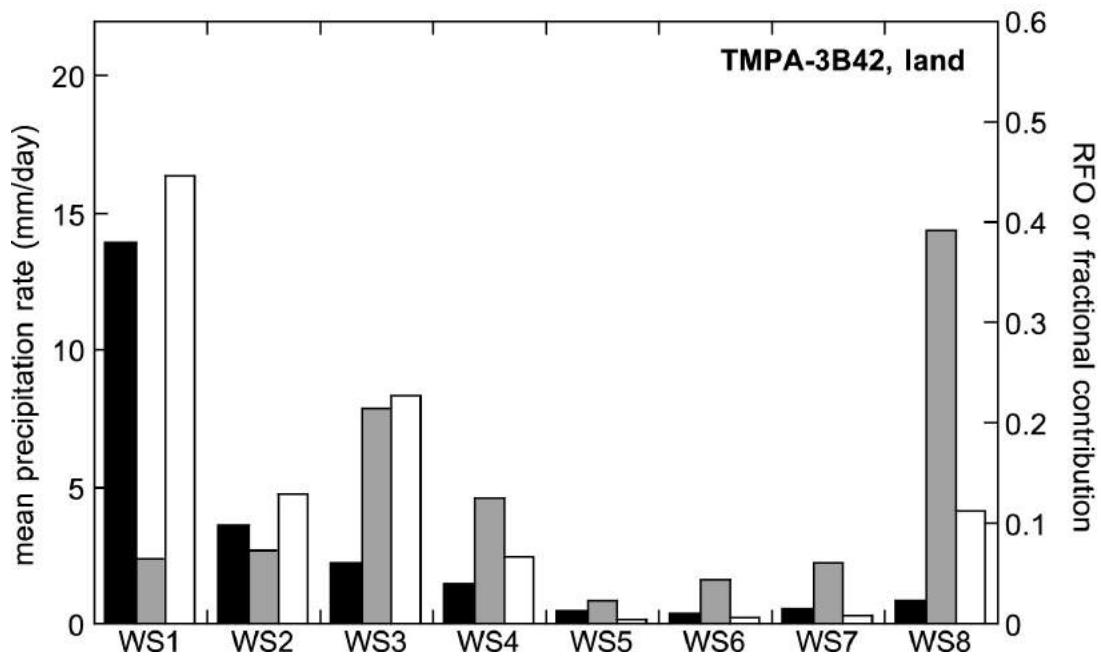
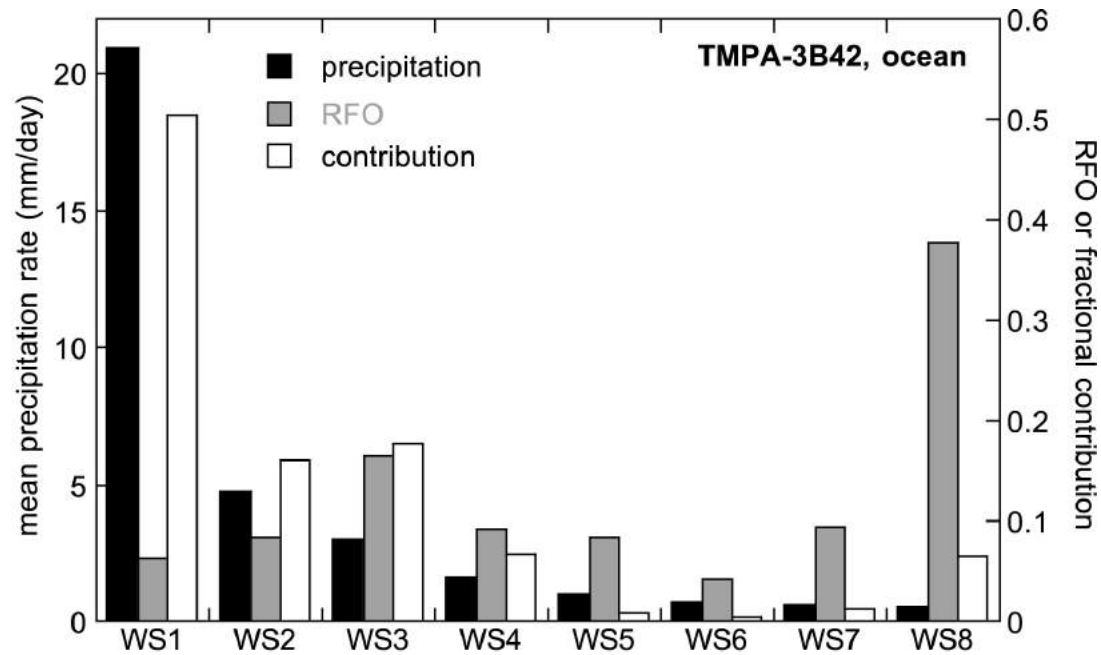
$$CRH = -\frac{1}{\rho C_p} \frac{dCRE}{dz}$$

CloudSat-CALIPSO
(2B-FLXHR-LIDAR)

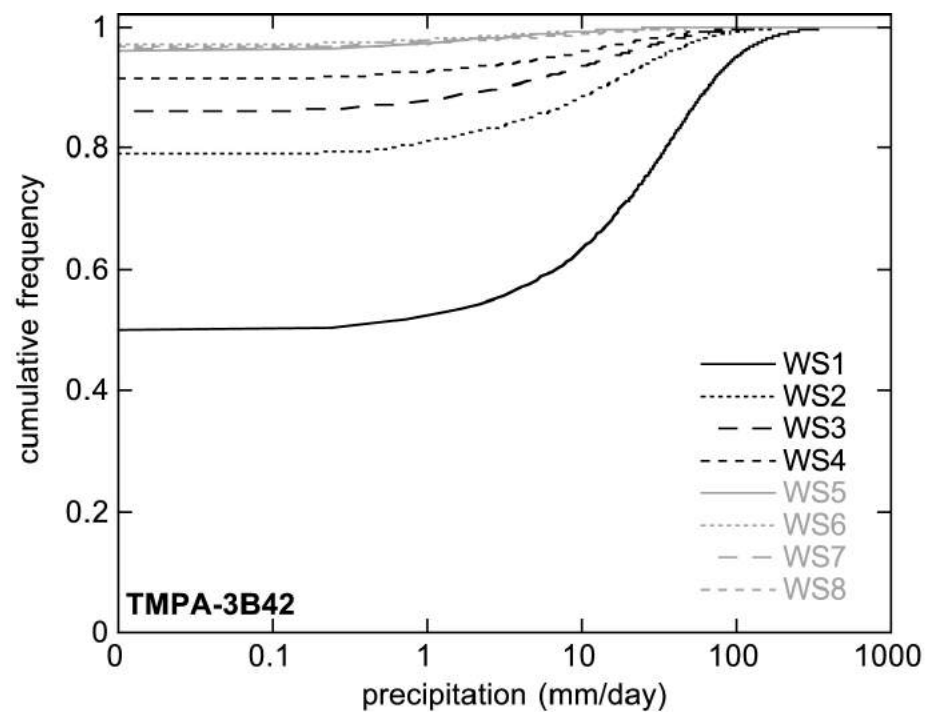


An aerial photograph of a large river delta, likely the Amazon, showing a complex network of channels and distributaries. The water is a mix of dark blue and light grey, indicating varying depths and sediment loads. The land is a mix of green and brown, with some snow-capped mountains visible in the distance. The word "Precipitation" is overlaid in a large, bold, dark blue font in the center of the image.

Precipitation

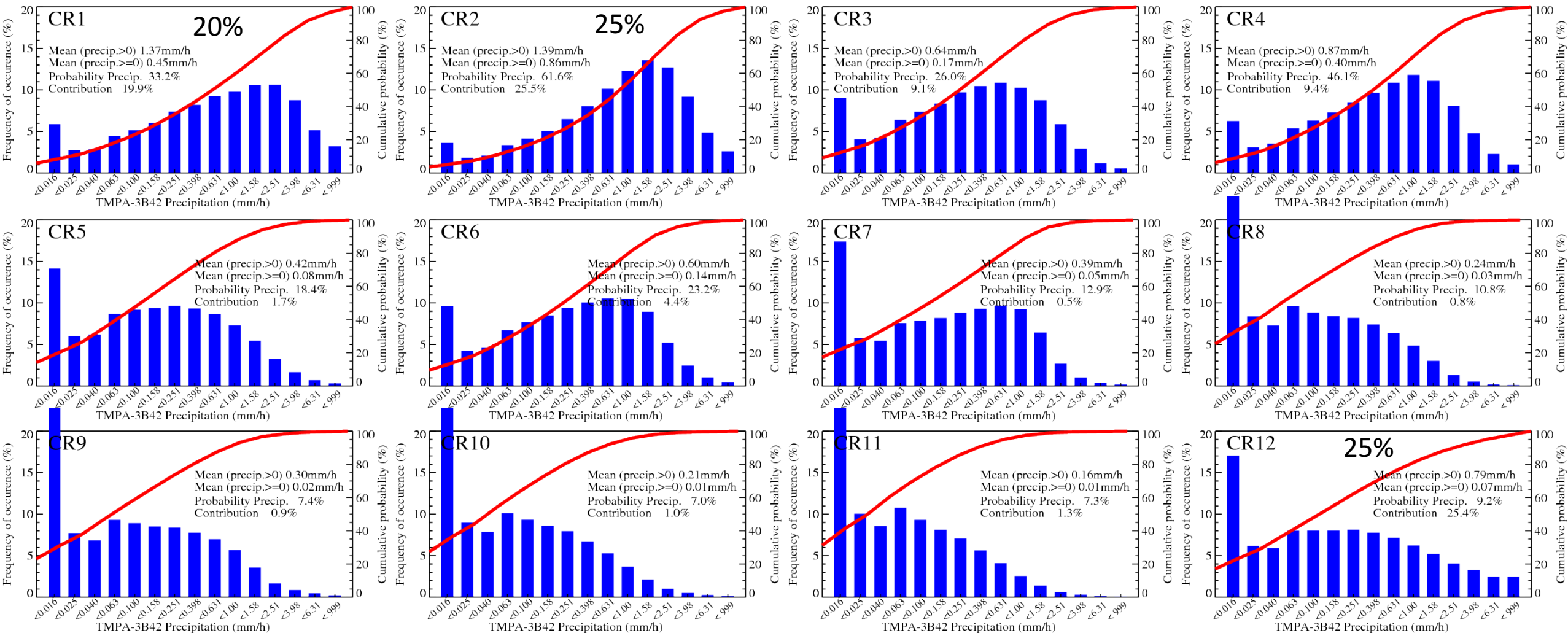


Lee et al., J. Climate, 2013





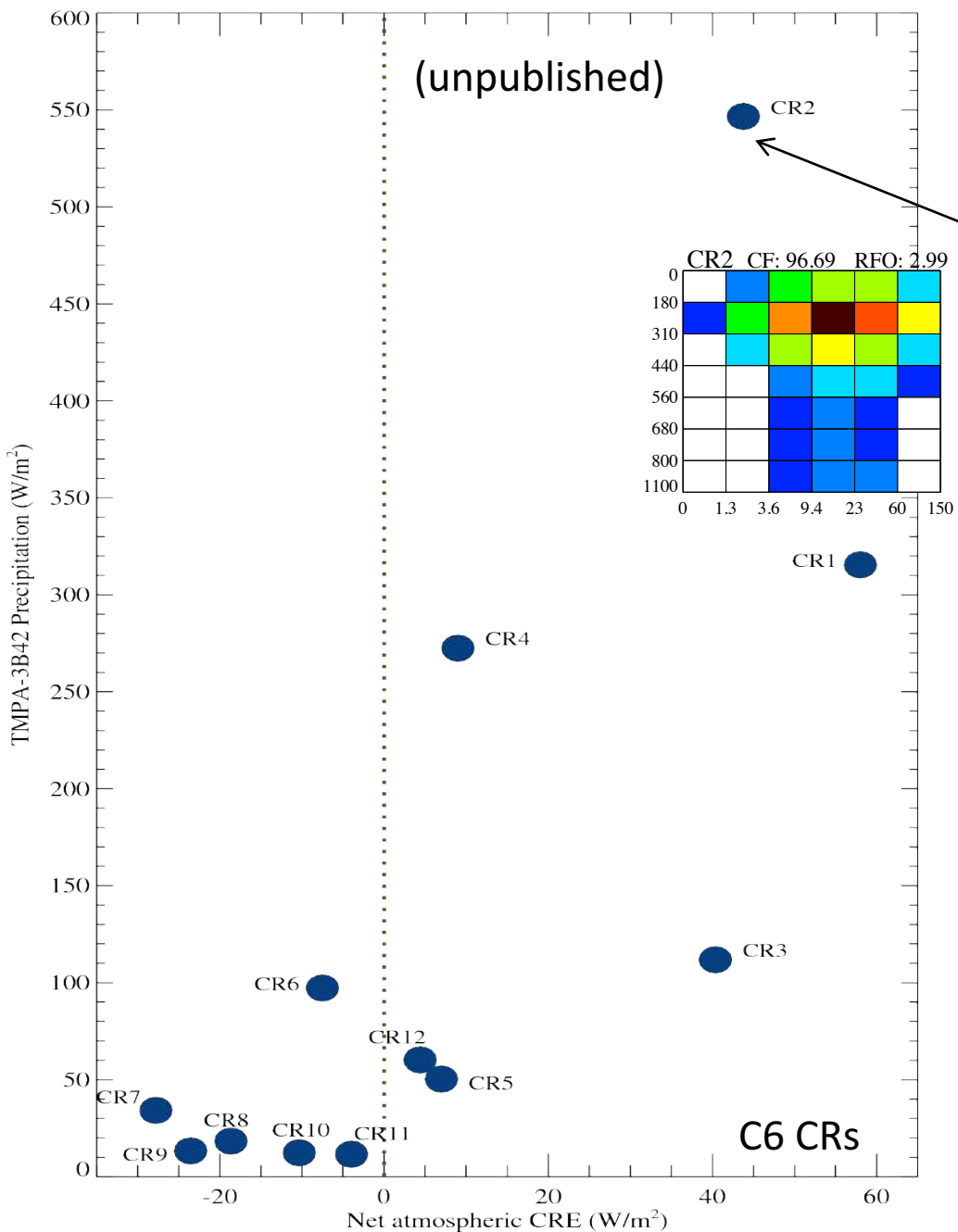
Precipitation (TMPA) of MODIS CRs (50S-50N)



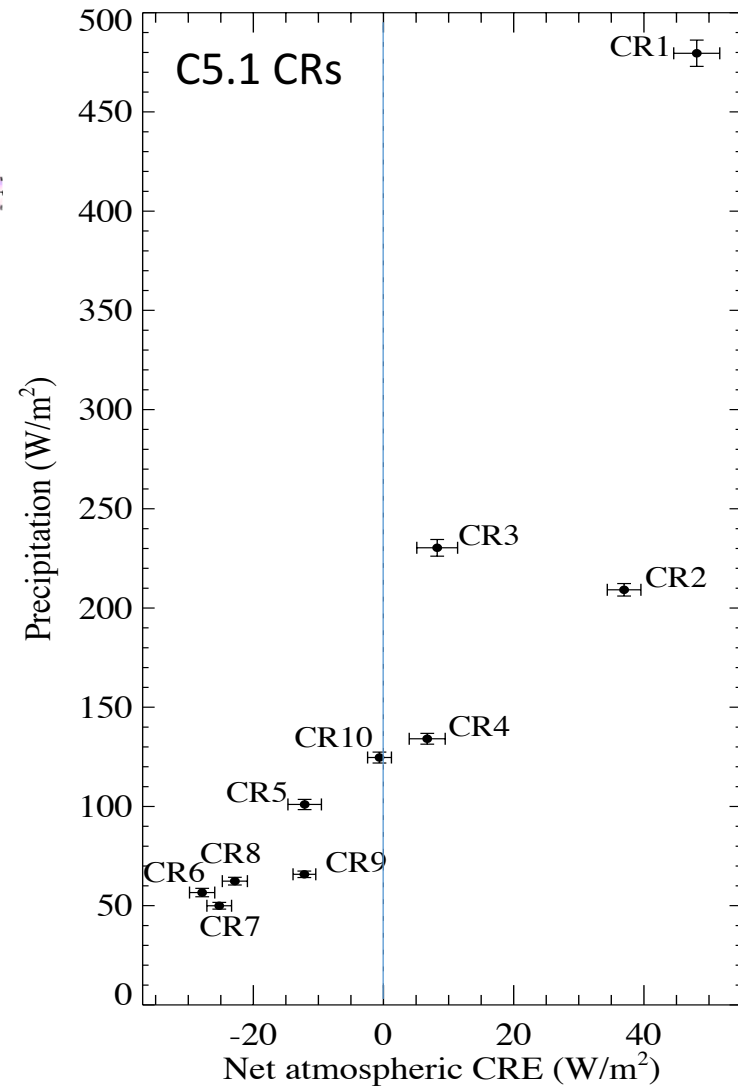
(unpublished)



TRMM



Radiative vs Latent Heating



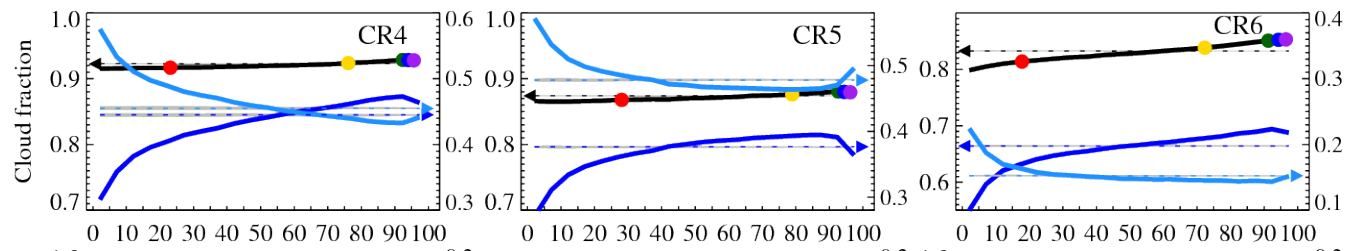
Oreopoulos et al. (2014)

An aerial photograph of a coastline. The top half of the image shows a large, dark blue body of water with white, turbulent waves crashing against a rocky shore. The bottom half shows a green, forested landmass with a white, snow-covered or sandy area. The text "Aerosol Indirect Effects" is overlaid in the center in a bold, dark blue font.

Aerosol Indirect Effects

Ocean

— Total Cloud Fraction — Ice Cloud Fraction — Liquid Cloud Fraction

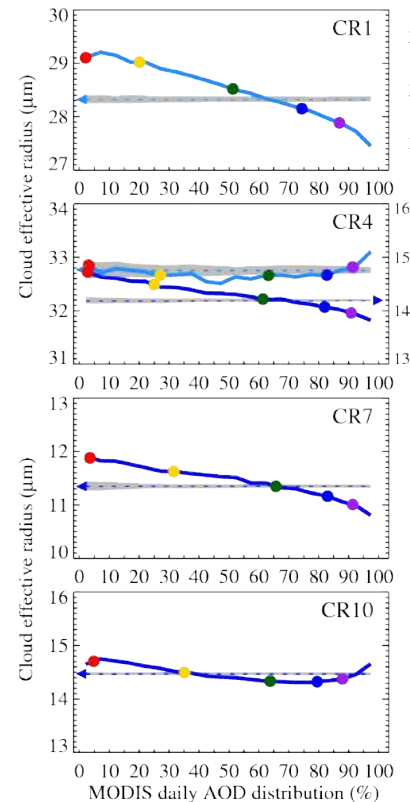
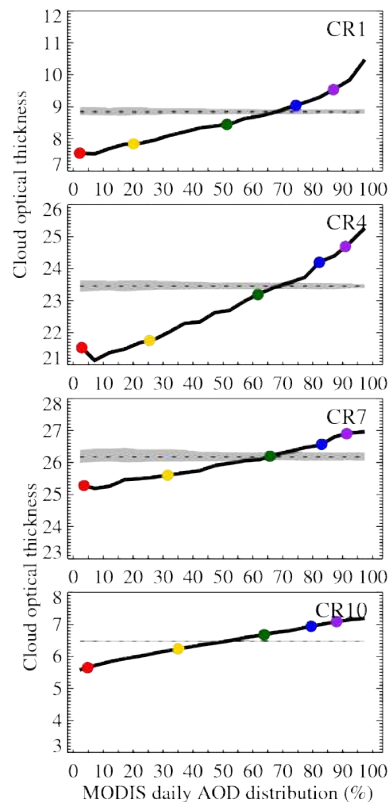


Cloud Fraction

Oreopoulos et al., JGR, 2017

Land

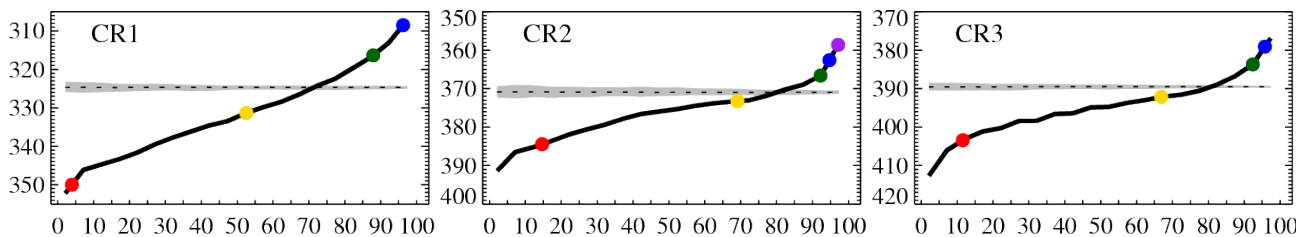
Cloud Optical Thickness



Cloud Effective Radius

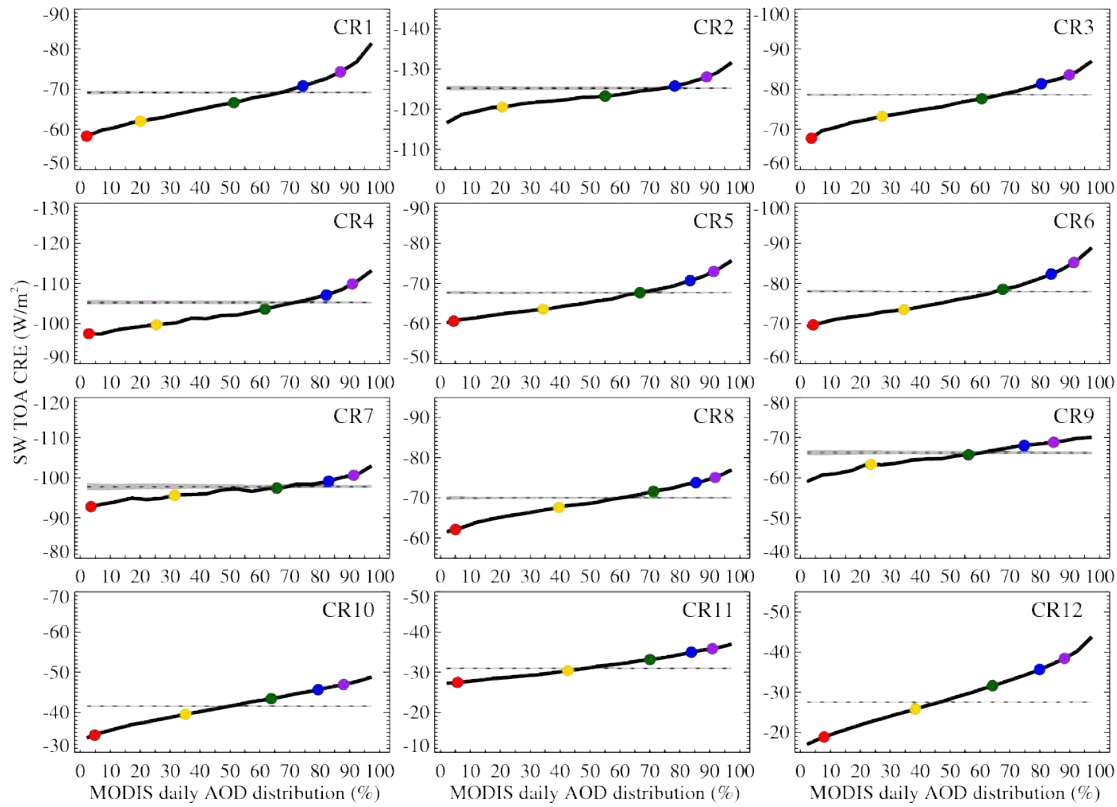
50S-50N

Ocean



Cloud Top Pressure

Land

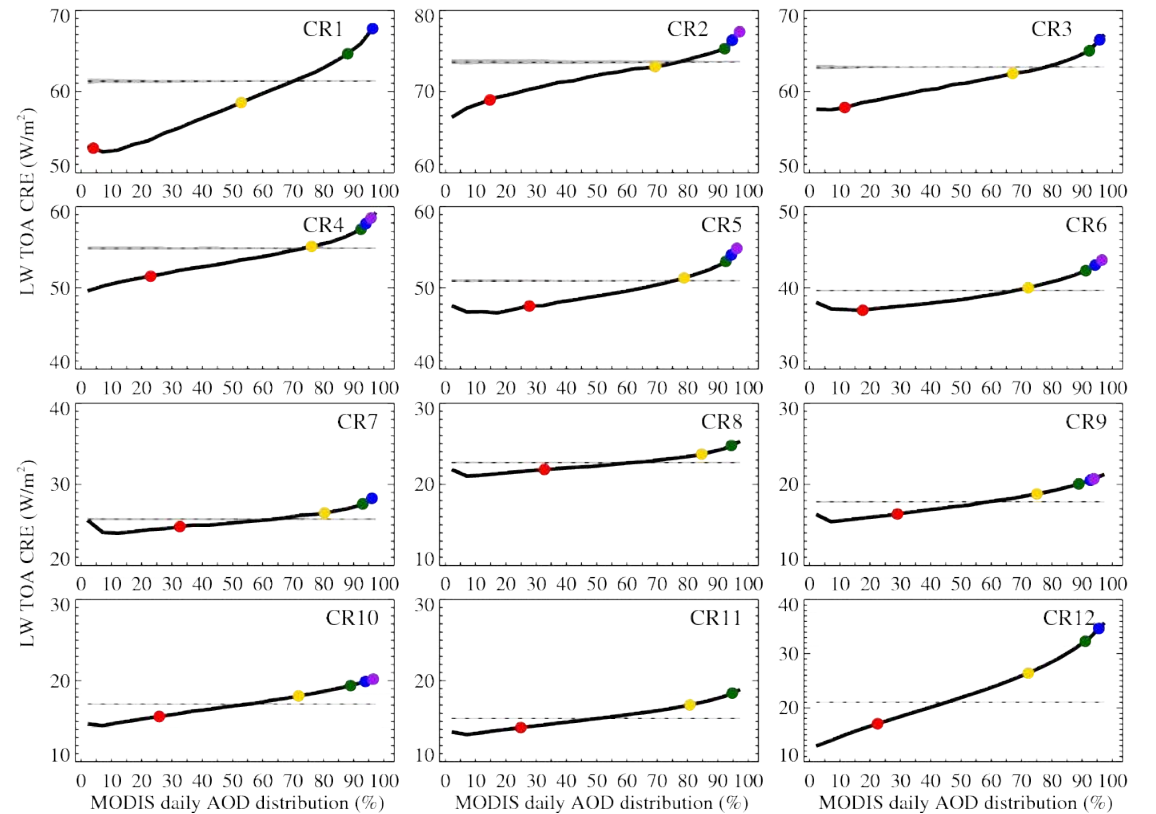


50S-50N

LW CRE

SW CRE

Ocean

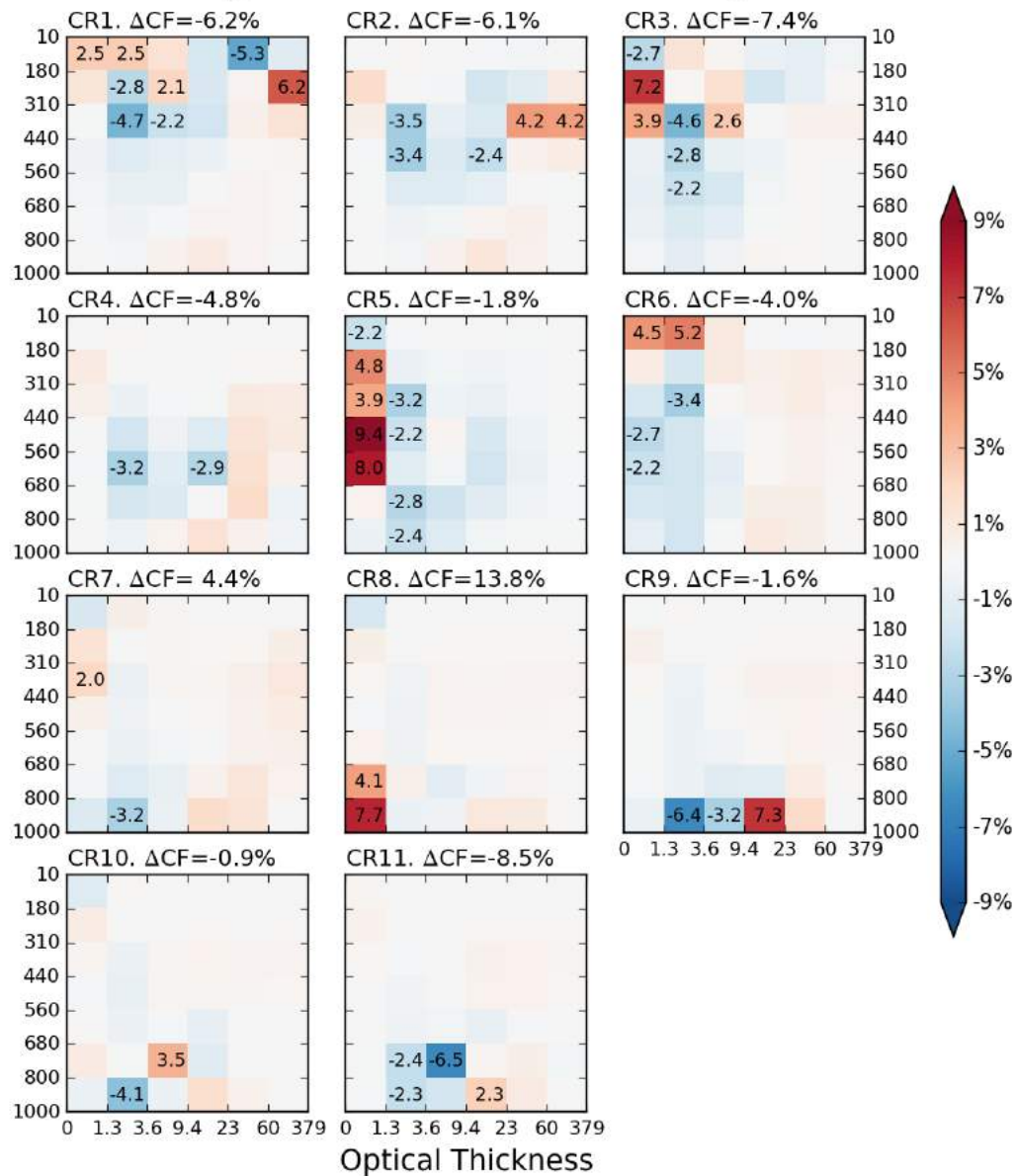


An aerial photograph of a large river delta, likely the Amazon, showing a complex network of channels and distributaries. The water is a mix of light and dark blue, indicating varying depths and sediment loads. The surrounding land is green and brown, with some white areas that could be snow or sand. The text 'GCMs' is centered in the image in a bold, dark blue font.

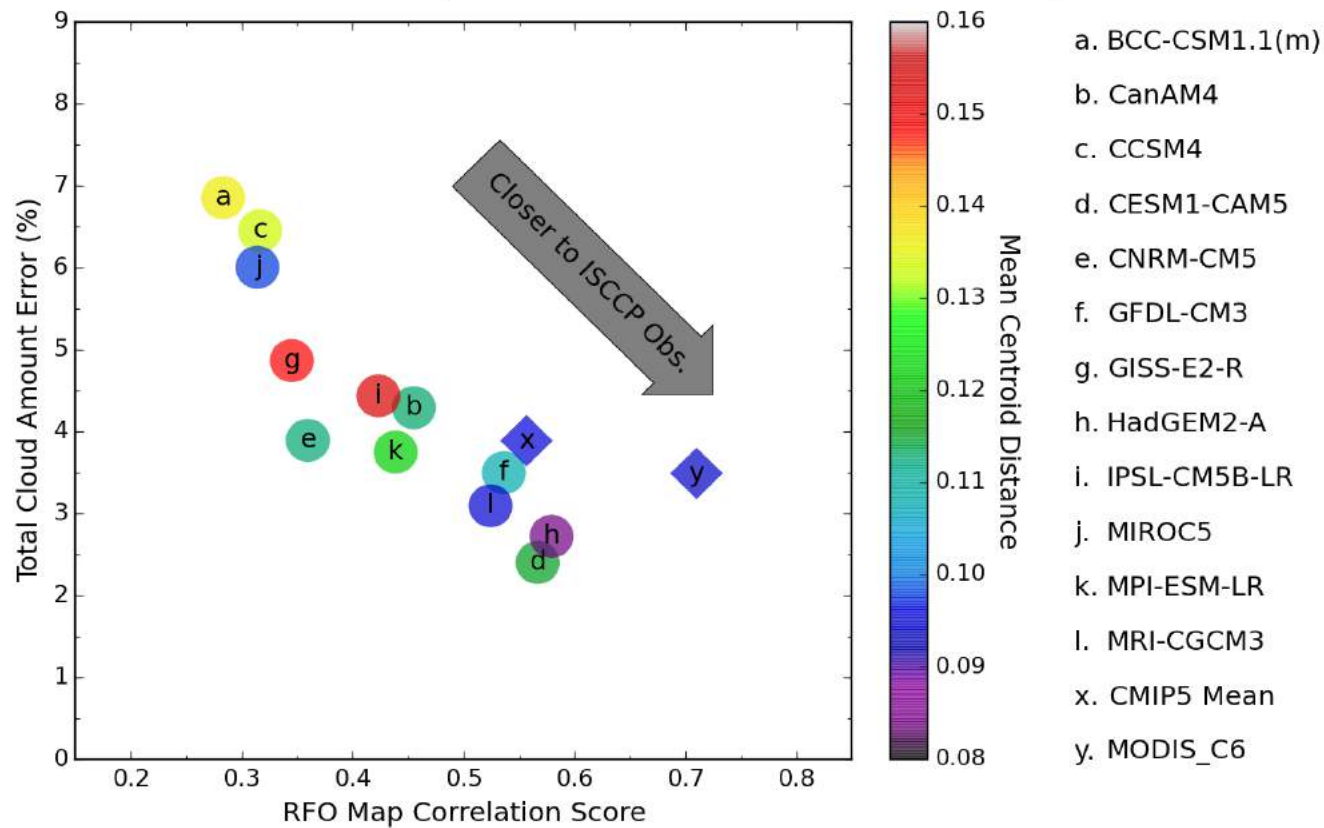
GCMs

ISCCP WS for CMIP5 evaluation

Cloud Regime Bias: CMIP5 Mean - Daily ISCCP

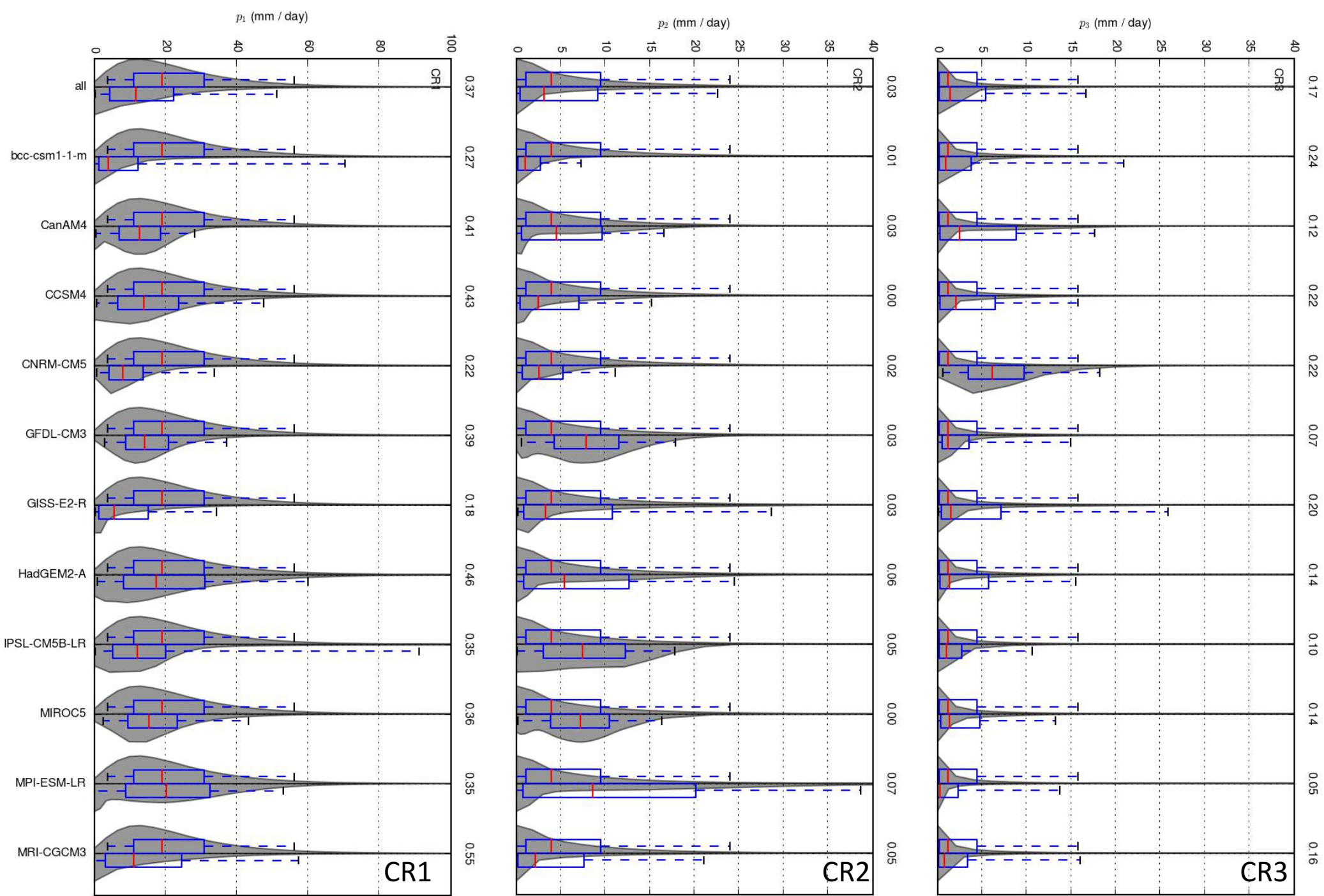


Overall Performance, wt=RFOxCF, 42-bin on 2.5x2.5deg





CMIP5 model precipitation (15S-15N) for CR1-CR3

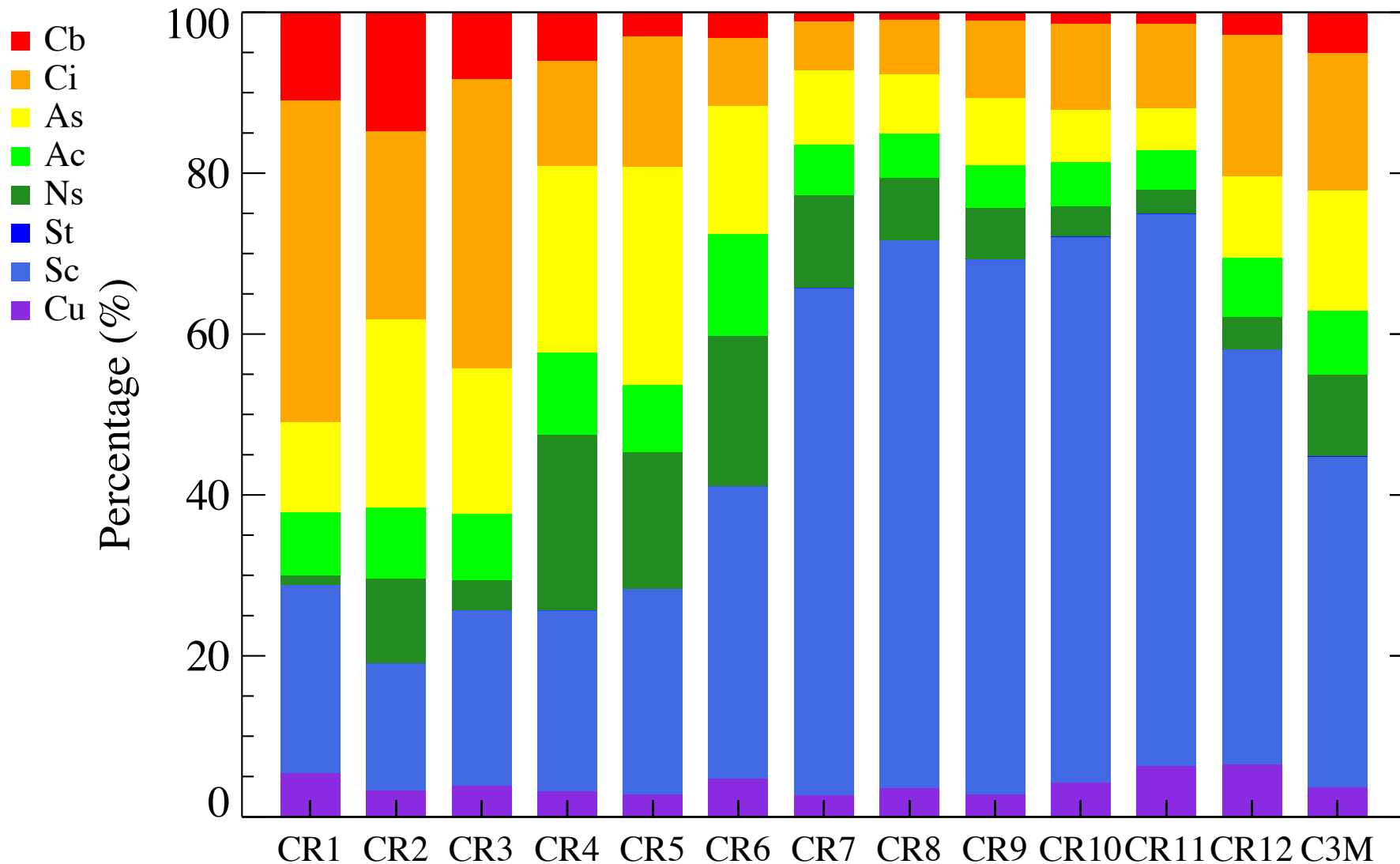


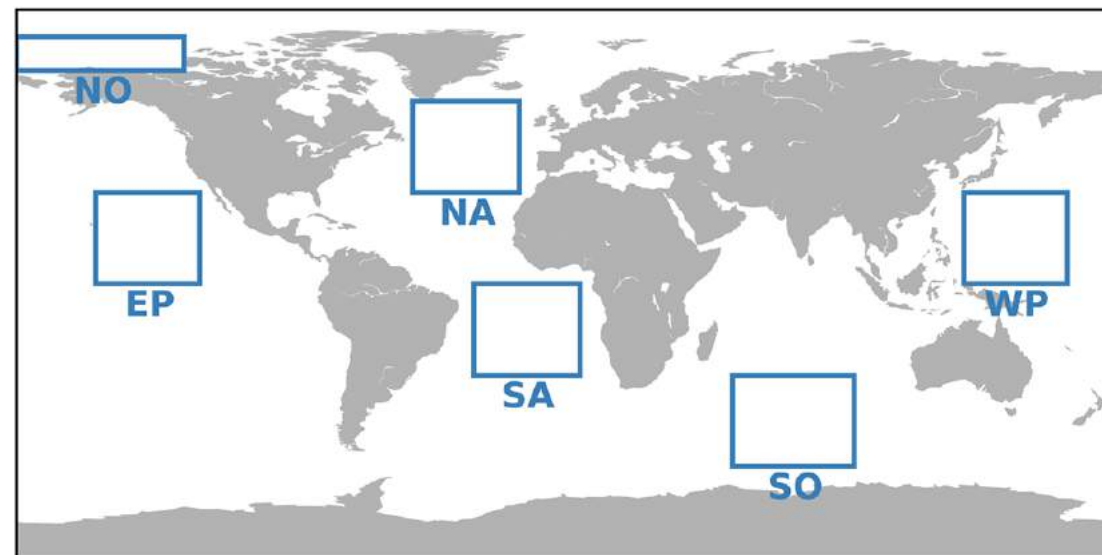
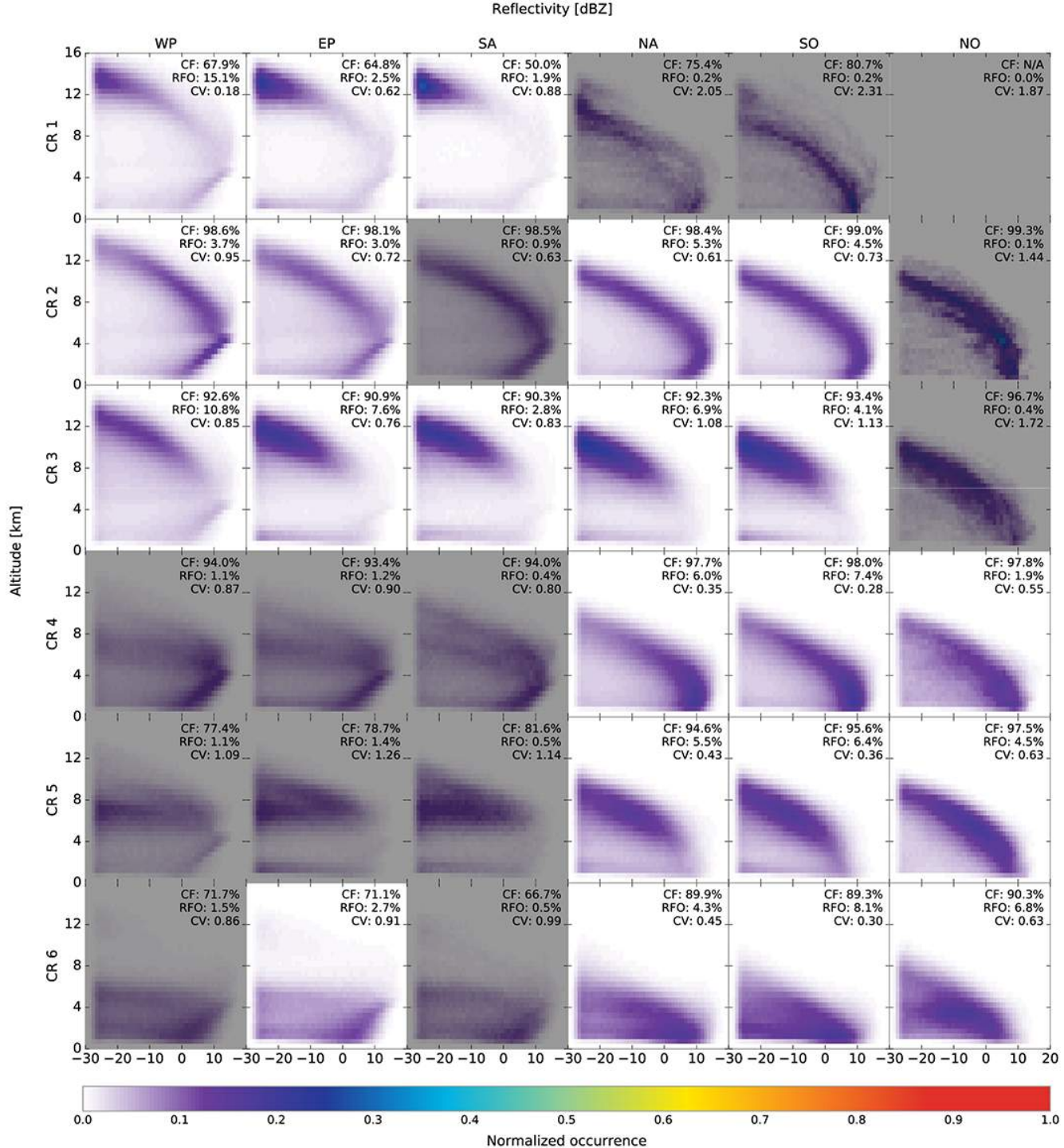
An aerial photograph of a coastal region, likely the Amazon delta, showing a complex network of river channels and sediment deposits. The water is a mix of light and dark blue, indicating varying depths and sediment concentrations. The surrounding land is green and brown, with some white areas that could be snow or salt flats. The text "Passive vs Active" is overlaid in the center in a bold, dark blue font.

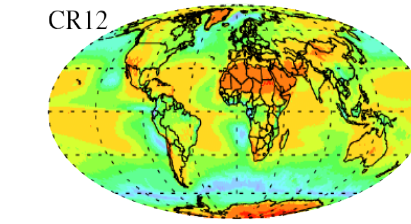
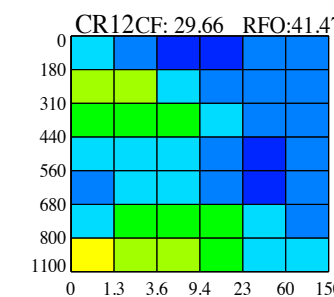
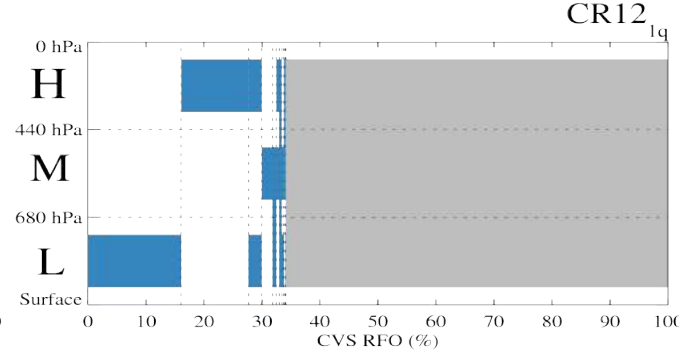
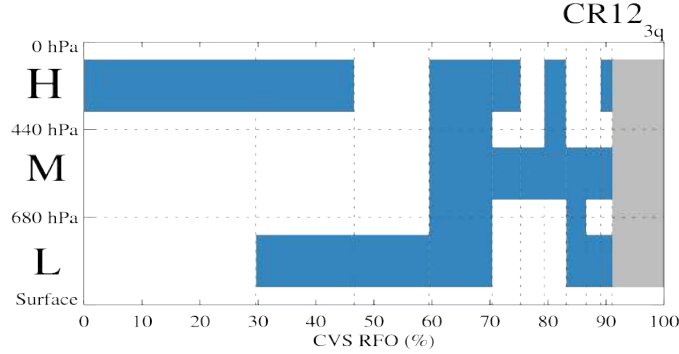
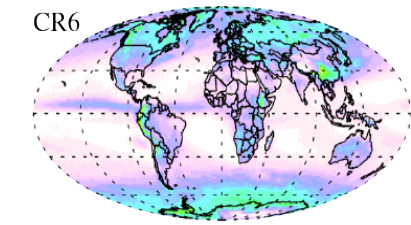
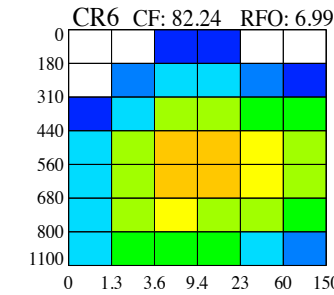
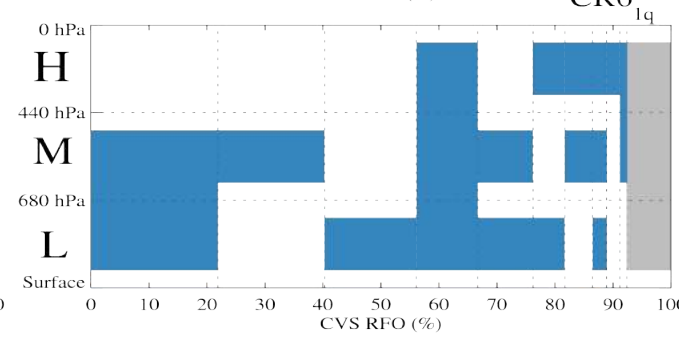
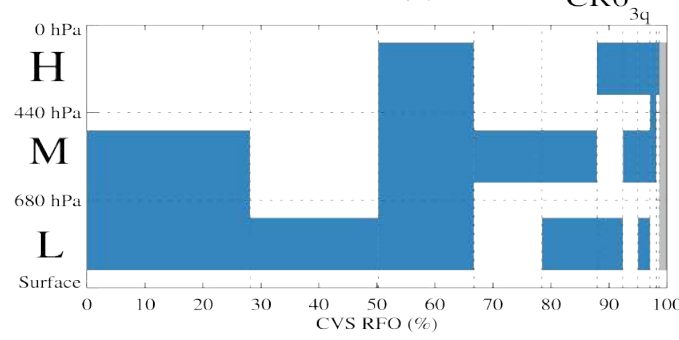
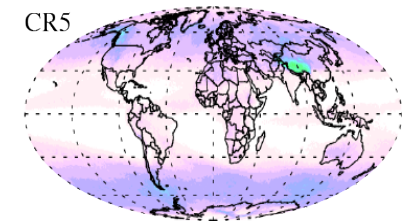
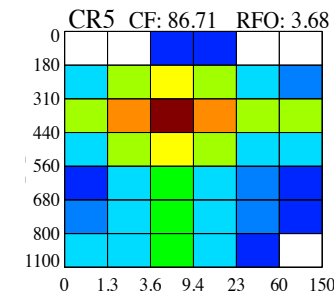
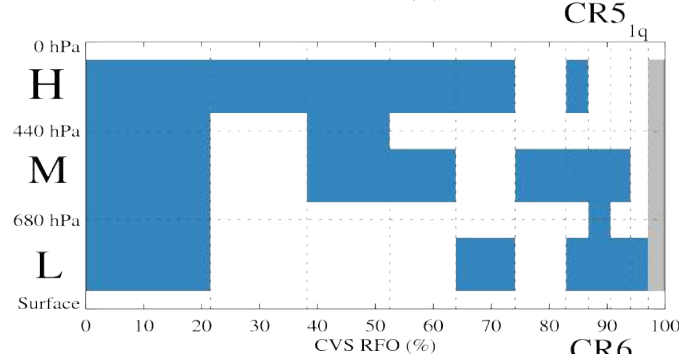
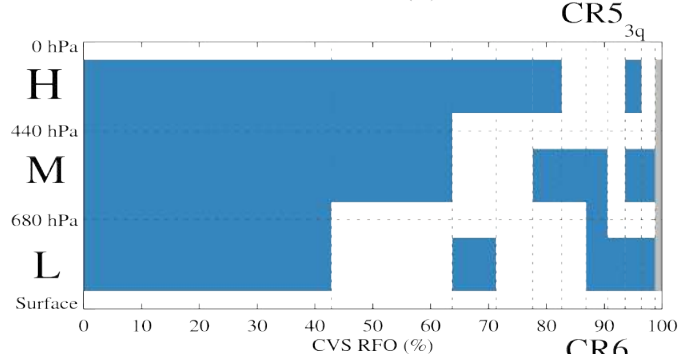
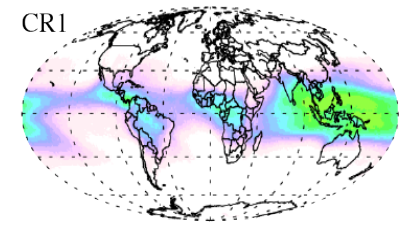
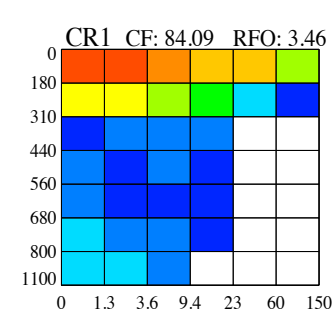
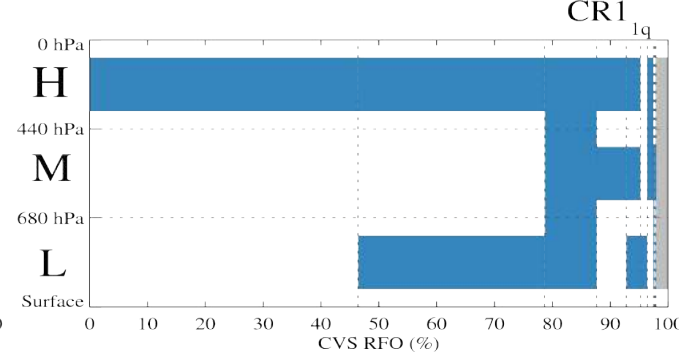
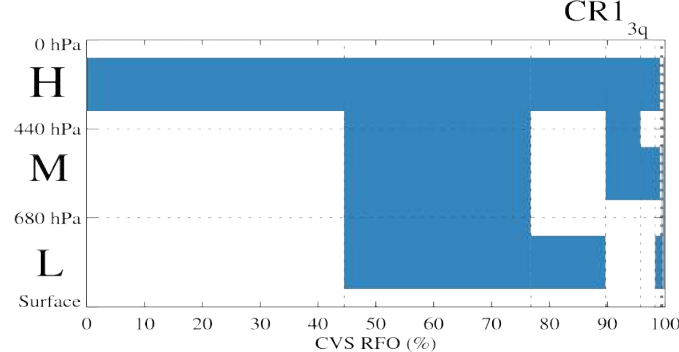
Passive vs Active



(Aqua) CR cloud type breakdown per CloudSat







From CloudSat-CALIPSO 2B-CLDCLASS-LIDAR product

Oreopoulos et al., JGR, 2017, in review

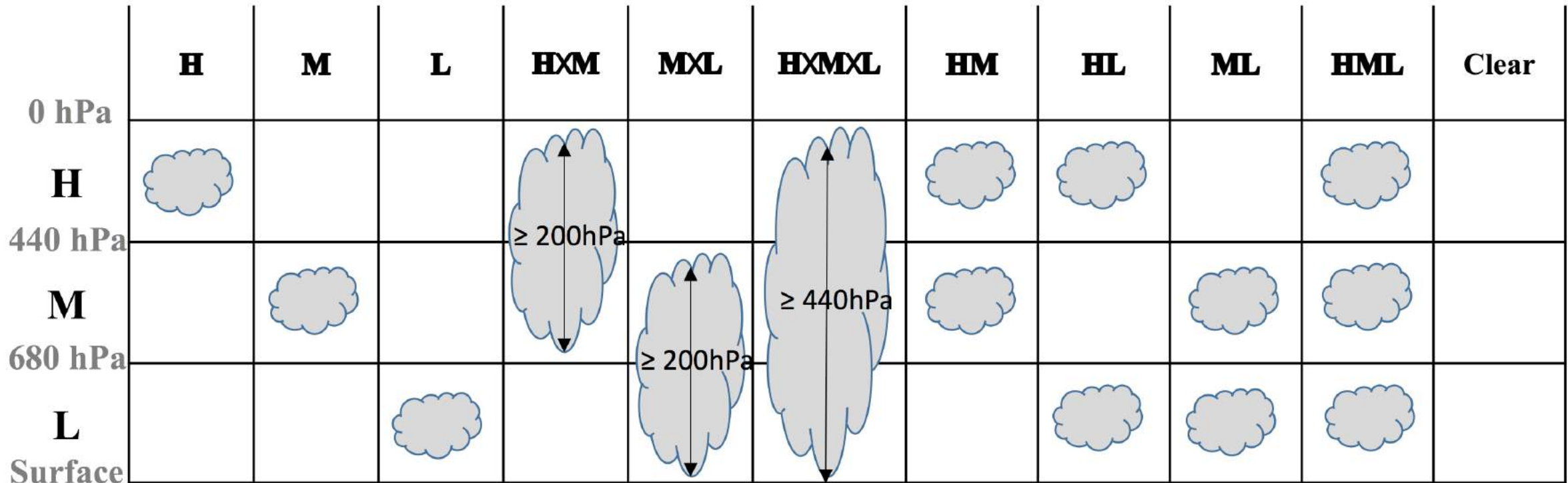
An aerial photograph of a large river delta, likely the Amazon, showing a complex network of distributaries and sediment bars. The water is a mix of light and dark blue, indicating varying depths and sediment concentrations. The text "Additional Slides" is centered over the image in a bold, dark blue font.

Additional Slides



Simplified Cloud Vertical Structures

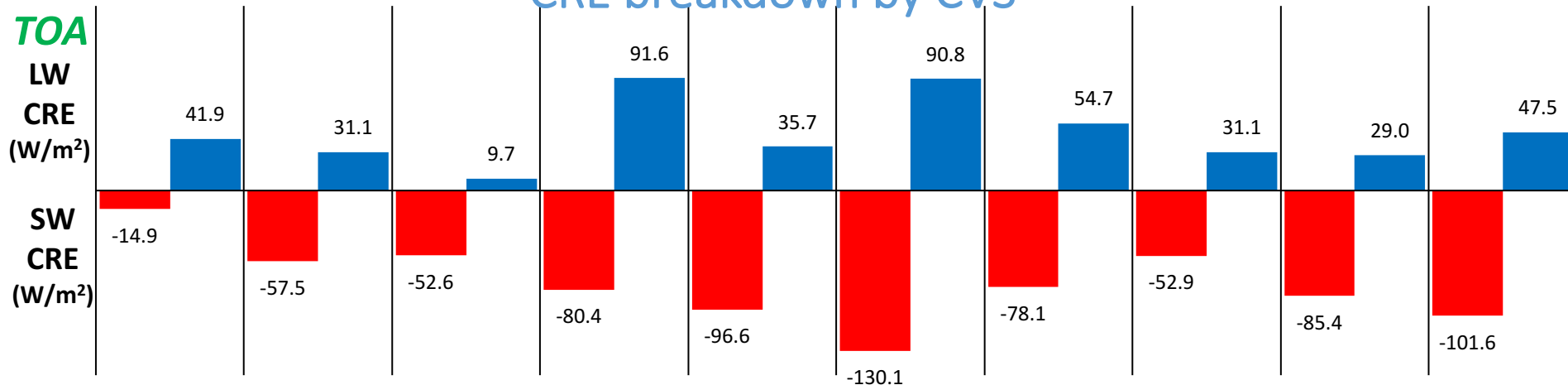
(from 2B-CLDCLASS-LIDAR)



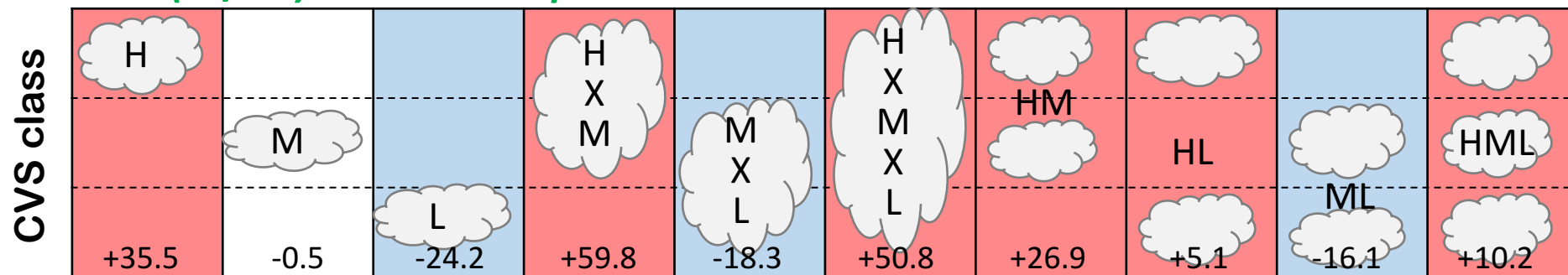
Similar to Tselioudis et al. 2013



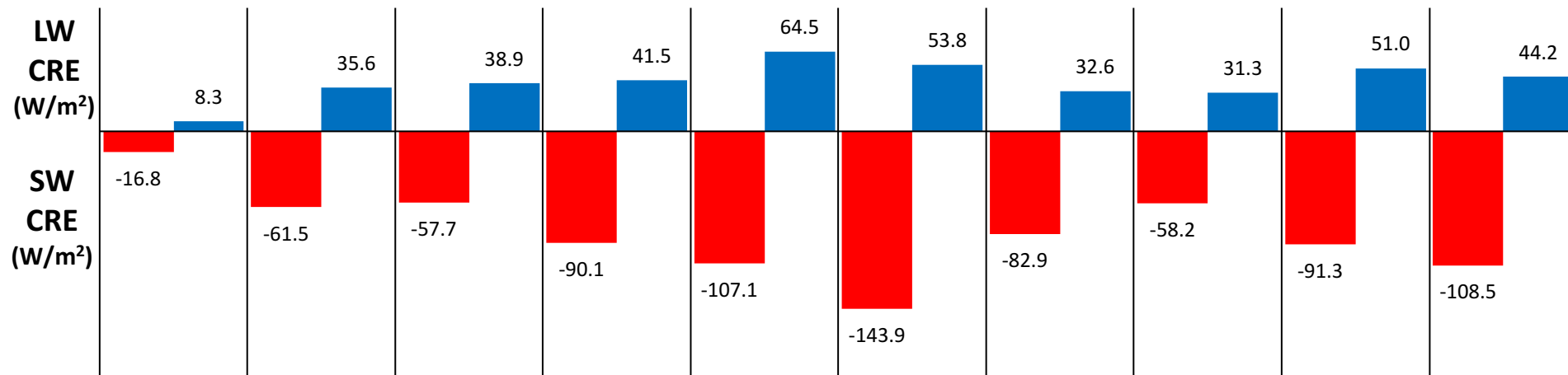
CRE breakdown by CVS



Total CRE (W/m²) in the atmosphere

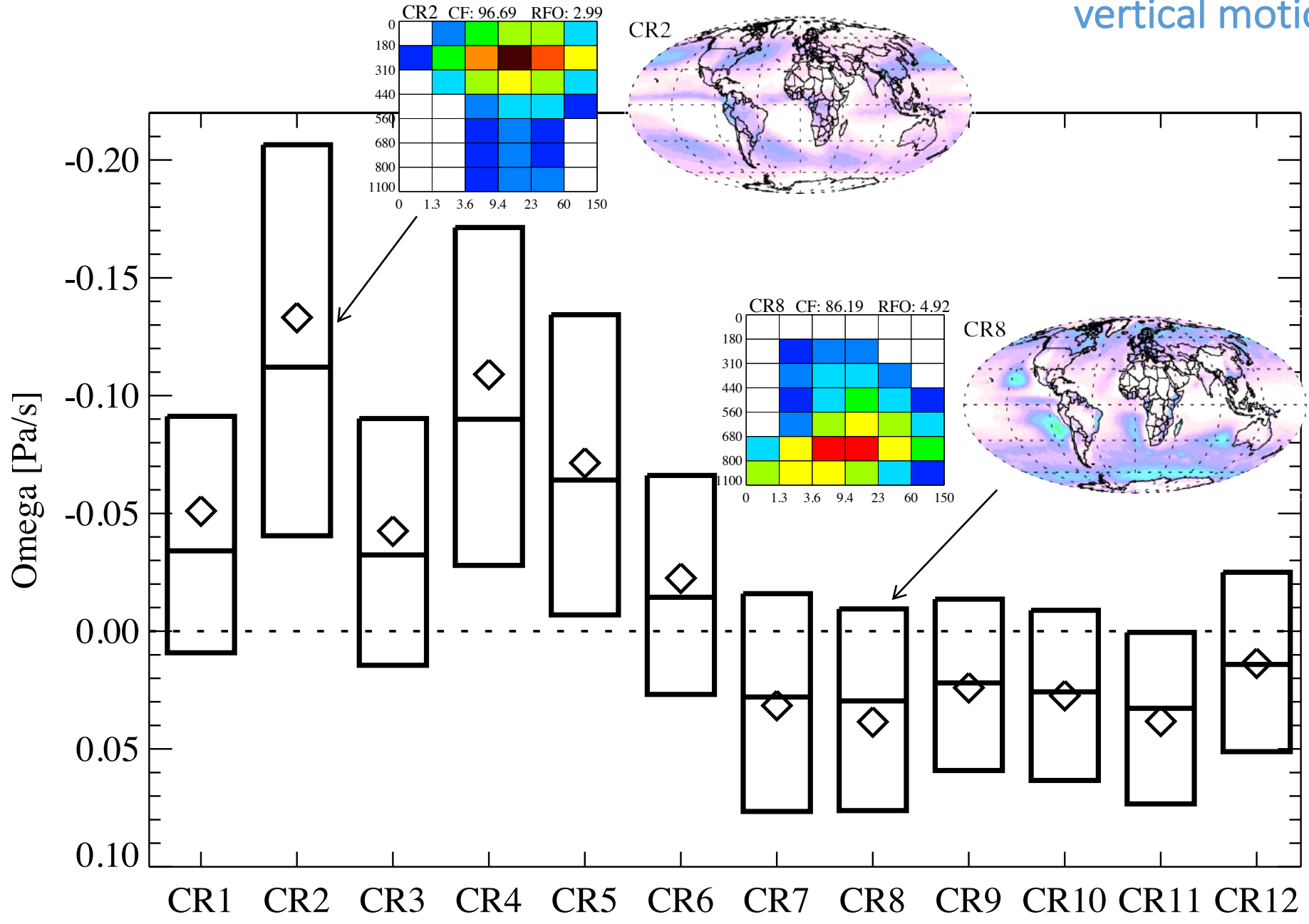


BOA

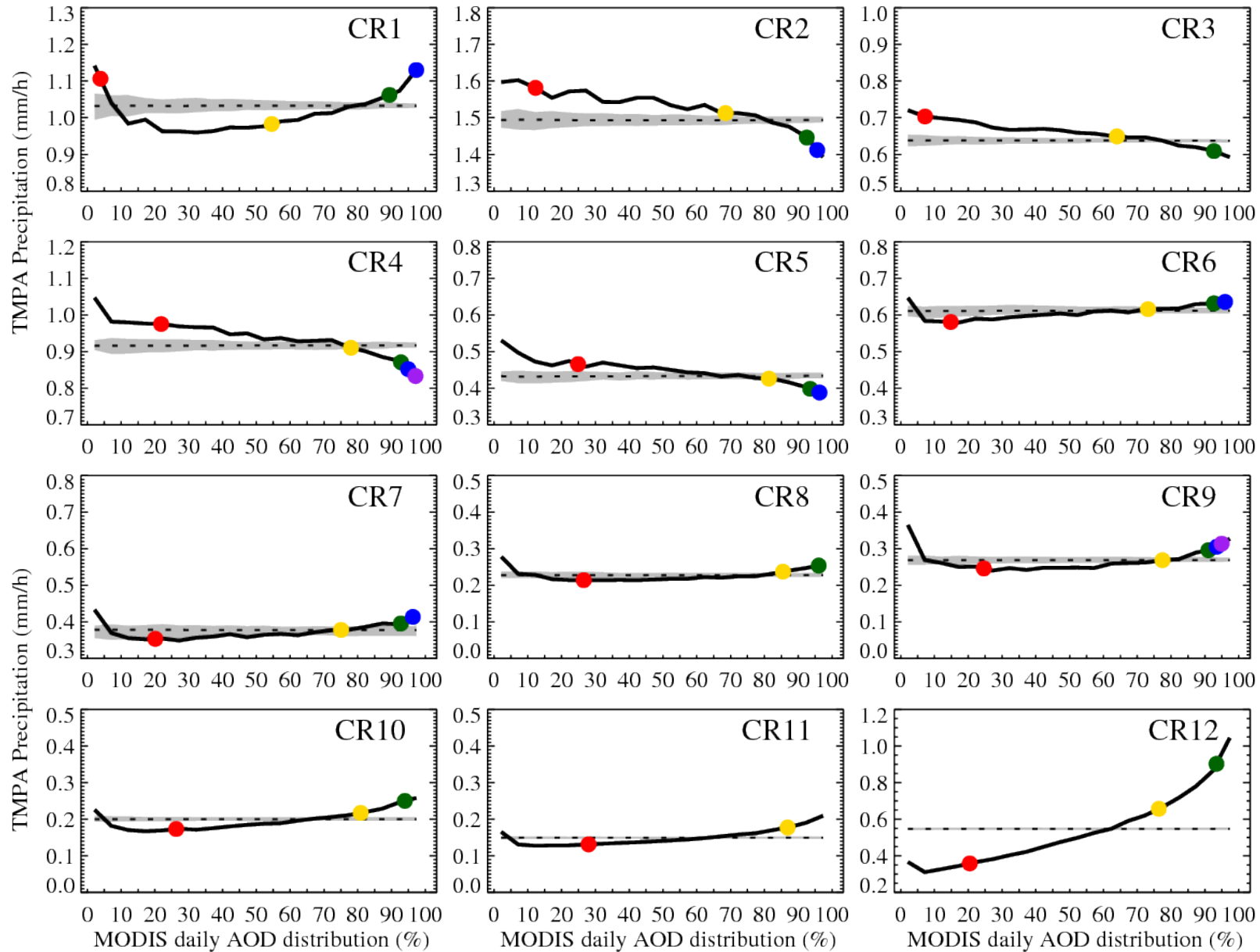




CRs and large-scale vertical motion



Precipitation rate



50S-50N