Improving precipitation in models

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Goals

- Objectively quantify the state of the art in simulating precipitation
- Increase the number of model developers working on improving the current state of affairs
- Demonstrate improvement

Why precipitation?

- Ramirez-Villegas et al., 2013, Implications of regional improvement in global climate models for agricultural impact research, Environ. Res. Letters:
  - “At these improvement rates, we estimate that at least 5–30 years of CMIP work is required to improve regional temperature simulations and at least 30–50 years for precipitation simulations, for these to be directly input into impact models”
- Can we wait that long?

Why precipitation?

- Because it matters to so much more than just our science
- Because we have a lot of relevant science already happening
- Because potential research funders care a lot about it
- Because it's hard to improve (and to measure!)
- Because improving it will likely affect many other things in models
- Because measuring improvement is more tangible than "reducing uncertainty"
- Because we need to work together to achieve it

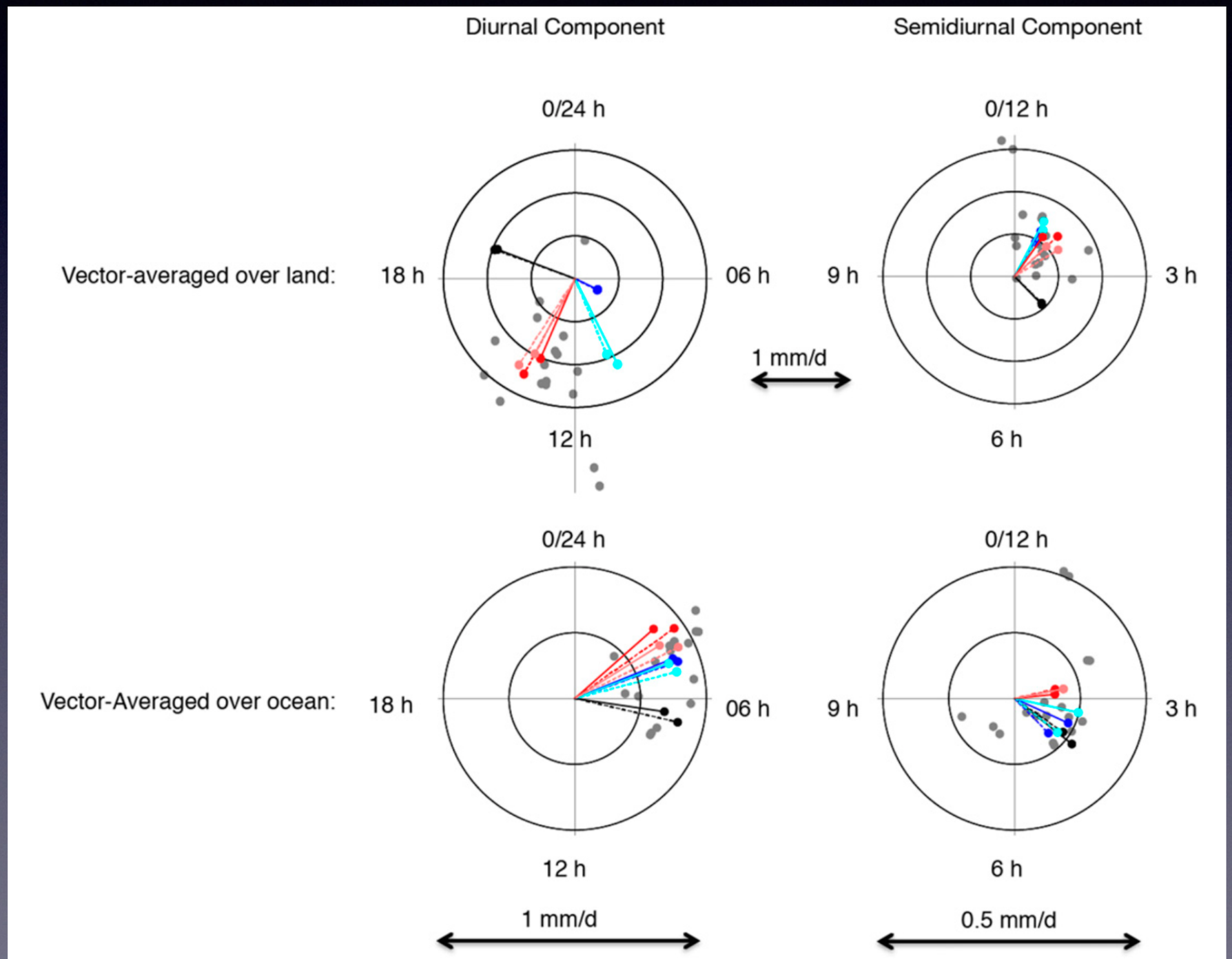
How?

- Step 1: A WCRP assessment report (and review paper) on the state of the art measured quantitatively

- Step 2: A serious attempt to increase the number of developers in this area achieved by engaging modelling centres and funding agencies

- Step 3: A repeat of the assessment report in N years, where 5<N<10

The state of the art

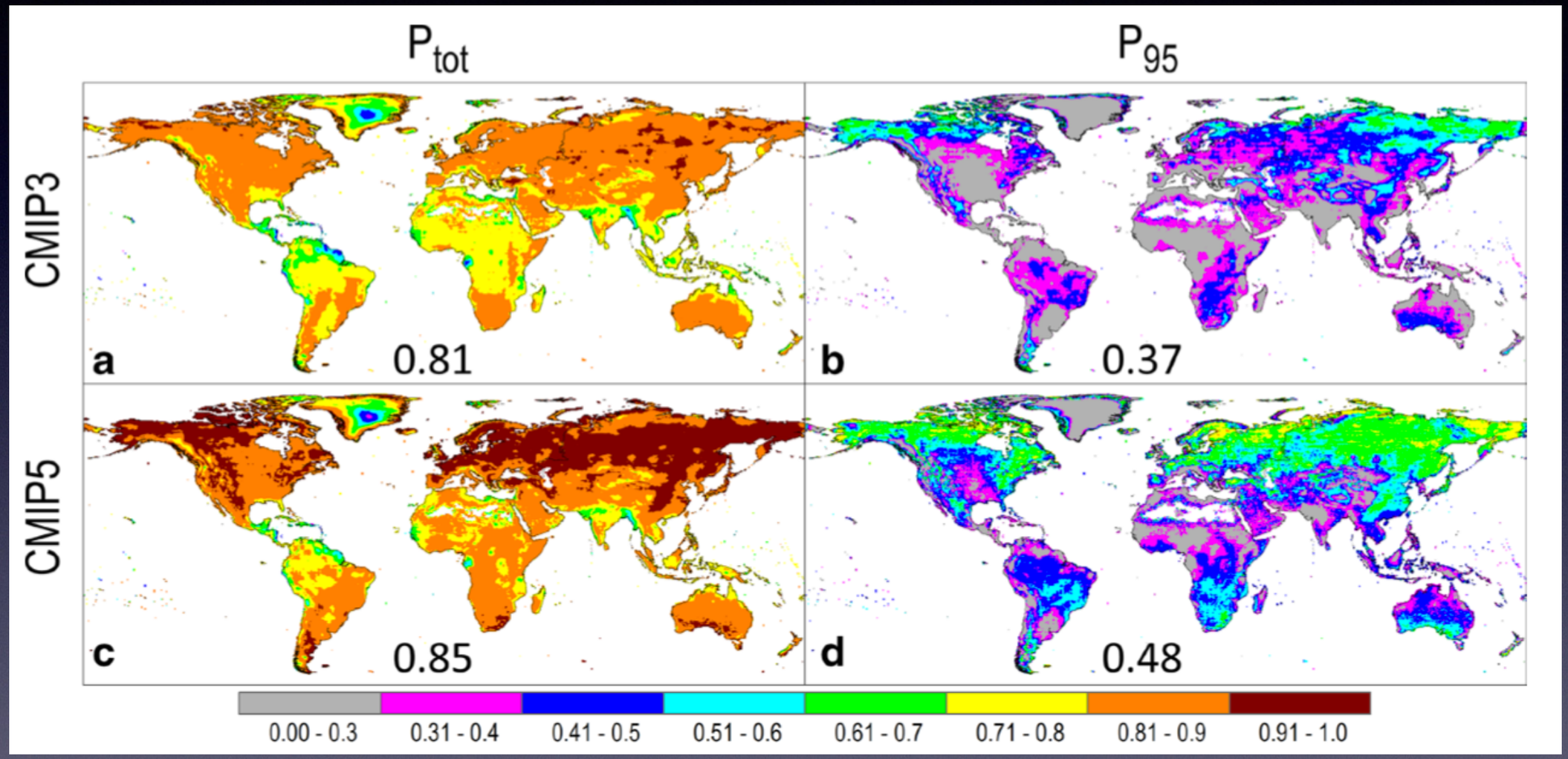


AMIP models diurnal and semi-diurnal phase and amplitude

Black = TRMM
Coloured = HiRes Models
Grey = Other models

Covey et al., 2016

The state of the art

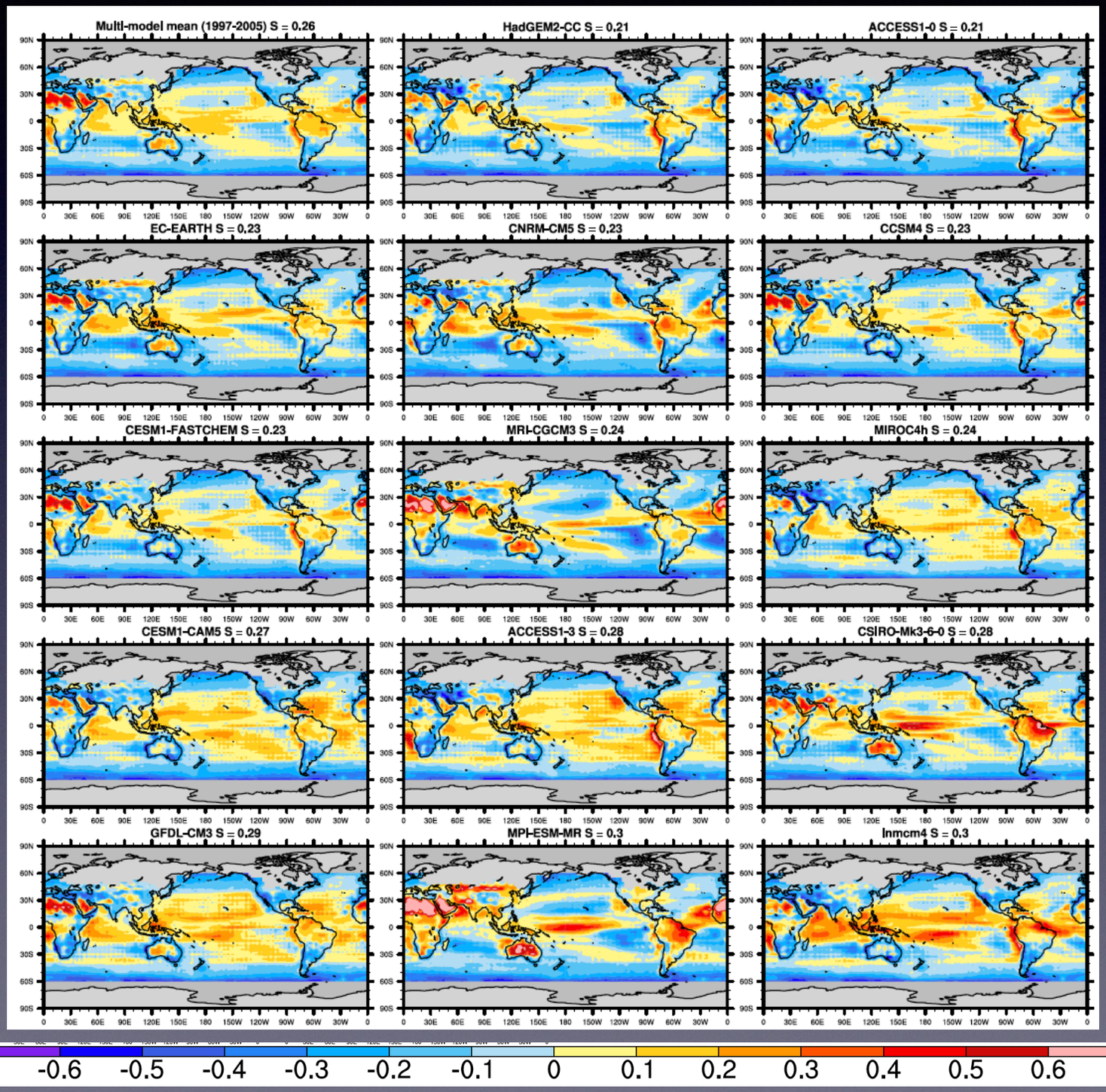


Perkins Score for P_{tot} > 1 mm/day and P_{95}

$$S = \sum_{1}^{N} \min\left(f_m, f_o\right)$$

Koutroulis et al., 2015

The state of the art



KS Two-sample test

P > 0.1 mm/day

Model vs GPCP
minus
GPCP vs CMORPH

Phase 1 - Assessment

- Small working group discusses and agrees on metrics and carries out assessment
- WCRP report and Review paper
- All tools are collected and made available

Phase 2 - More modellers working on solutions

- Engage with centres and funders to highlight needs and opportunities for improvement
- Don’t prescribe path or priorities!
- Some challenges:
  - Needs buy in from at least a few centres/funders to provide the necessary momentum
  - Perception of need for perfection
  - Expectations beyond simply improving precipitation
  - “Yet another thing”

Connections

- GC Clouds activities: Rainbands, Stormtracks
- GEWEX activities: GASS, PROES, Observation assessment
- Metrics Panel and routine evaluation tools
- Planned meetings: WGNE Systematic errors, WMAC/GC Future of Cu-Parametrization