VORTEX

Model data to assess wind climate variability (in Chile)

GTER Grupo de Trabajo 2 / Variabilidad Interanual en el Norte de Chile
Agosto 2014

Content

- Model data
- Some validations on Chile
- Usage and recommendations (open discussion)
- Further actions (to discuss)

What we need to know

- Particularities of the Chilean wind regimes at different scales
- Meso to local wind regimes
- SS2S Variability (sub-seasonal to seasonal)
- Future climates and trends
- Translate to Wind Industry practice

Model Data

Which answers we can get from modeled data

- Large-scale picture from retrospective global db as Re-Analysis (ERA-Interim, MERRA, CFS/CFSR, JRA)
- Amplitudes of variability via downscaled products via regional climate modeling for end-users applications (long-term uncertainty penalties, MCP ....)

Model Data

How reliable are model retrospective products?

- Do they catch intra-annual and inter-annual variability?
- Do they get the amplitudes of extremes events ?
- Do they represent mean flow conditions?
- Do they portrait coherent daily patterns?
- Do they represent daily cycle signals?

Model Data

How reliable are model retrospective products?

- Which is the best metric?
- Acceptance *VISA*:
  - correlation coef > threshold (*as a first guess*)
  - No *doubts* on coherence over time (consistency) and no *weirdness* (whatever it means)
  - Validations references in *the region*
  - Other measurable factors (based in stats & metrics)
  - Other non-measurable factors

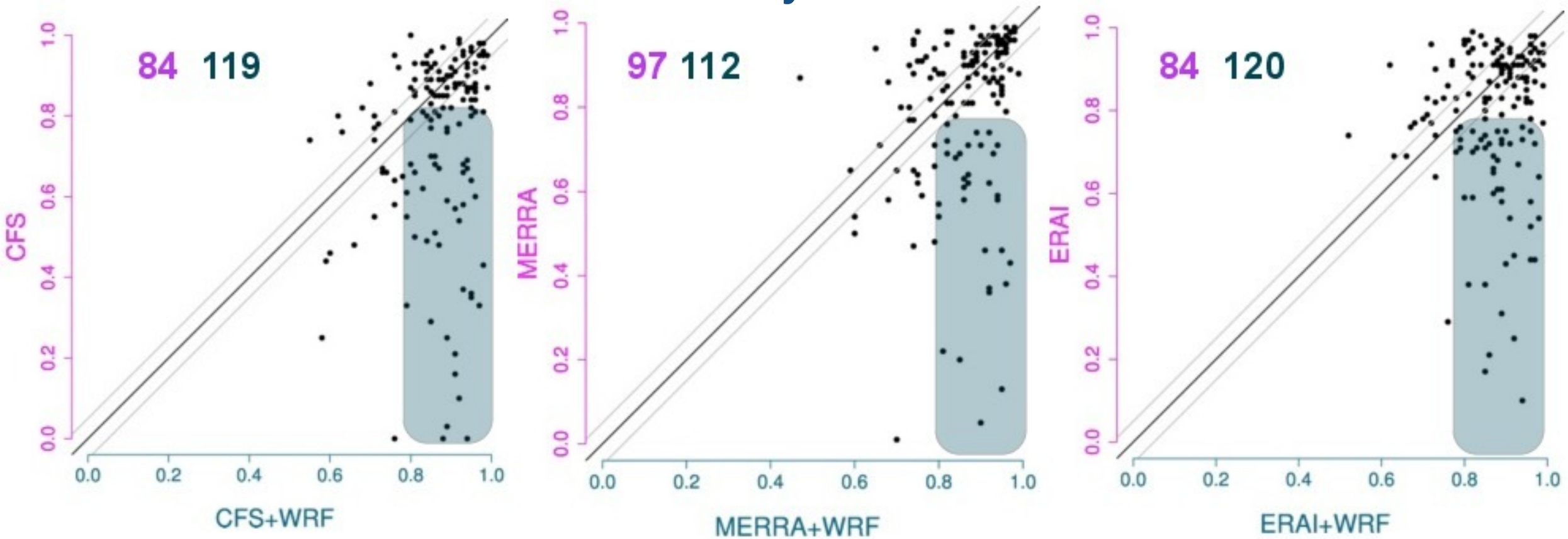
Model Data

Which resolution: Reanalysis vs Downscaled Products

- Downscale inherits features from Reanalysis (drivers)
- Motivation on use Downscaled products:
    - Peaks the amplitudes of the variability
    - Extremes events
    - Usage

Model Data

Which resolution: Reanalysis vs Downscaled Products



Scatter plot, Monthly R^2 Drivers vs Meso (WRF 3KM), 12 months period

Model Data

Which period: how many years are enough?

- Open discussion
- Climate context: Include low frequency variability
  - reproduce, at least, a low and a high modulation
  - robust number of extremes events (P90)
  - trends on extremes
- Conservative perspective is not always the best procedure
- Don't mix artificial changes (time inhomogeneities) and climate variability modulation

Model Data

Which period: how many years are enough?

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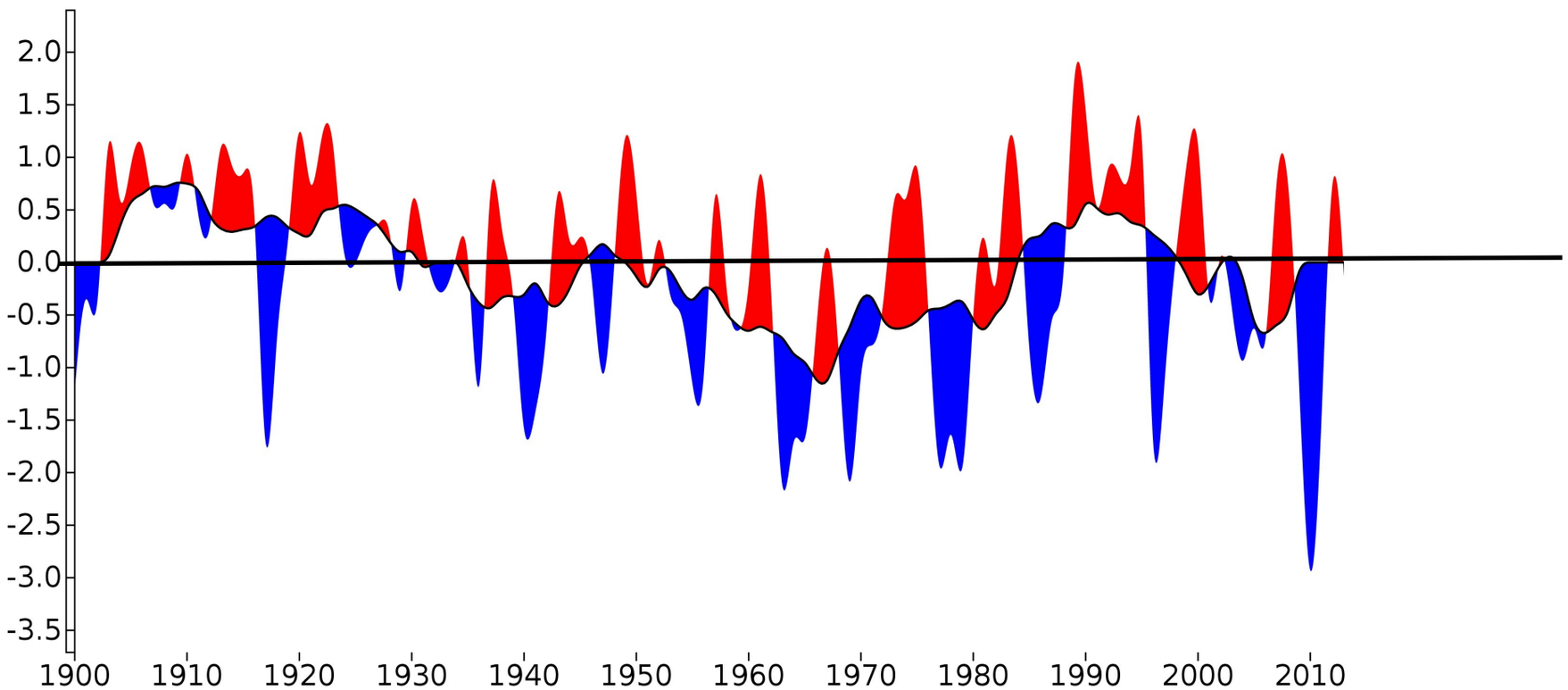

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Model Data

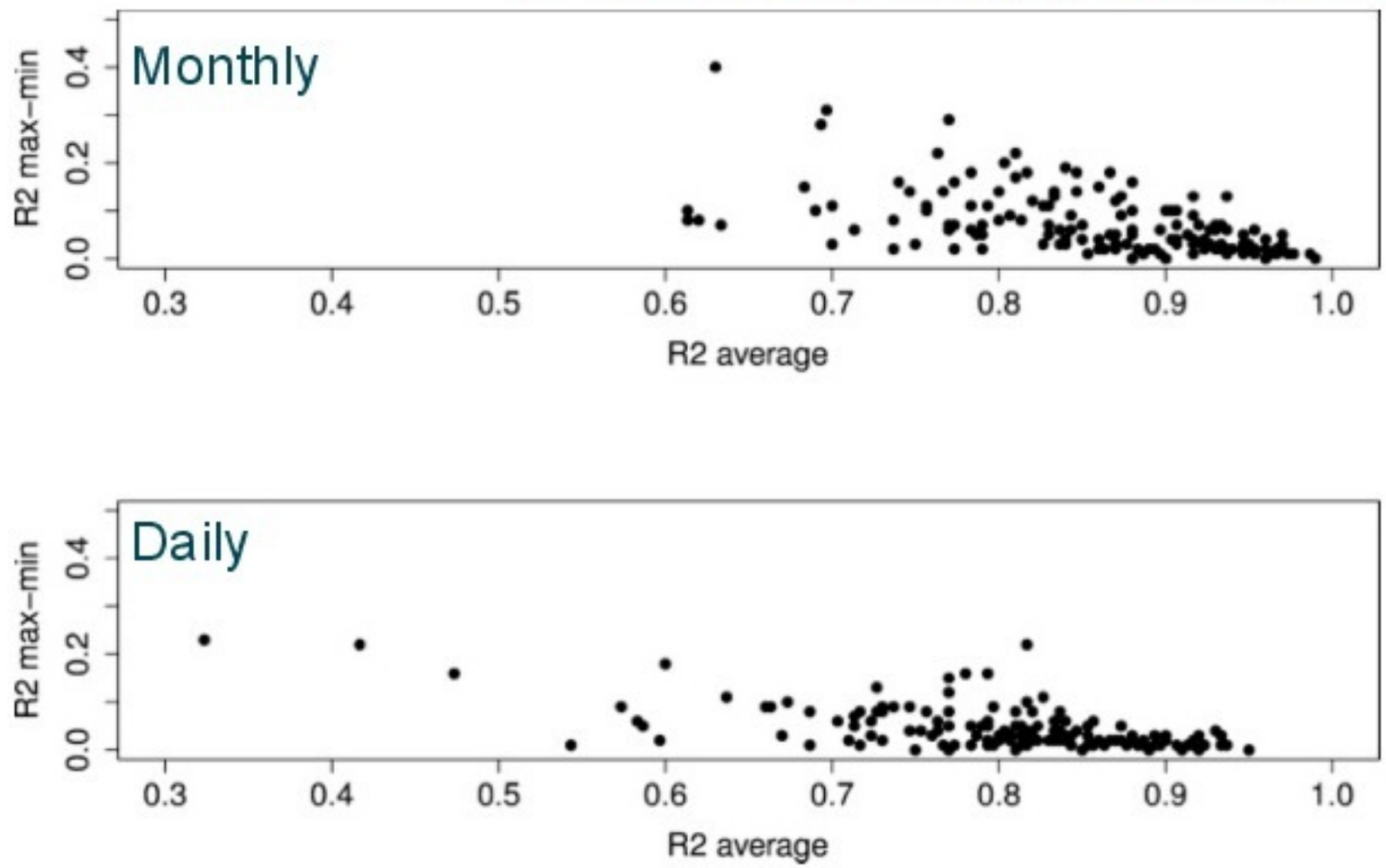
Which flavour: how many sources?

- Open discussion
- Not enough sources to quantify model uncertainty
- Inter-comparation of different sources can be an indicator of robustness
- Use transparent data
- Apple & Pears

Model Data

Which flavour: how many sources?

R^2 dispersion= max(R^2)-min(R^2) across all the series



R^2 dispersion against R^2 mean across
Meso Series (WRF 3KM) driving CFS, MERRA and ERAI
12 months period

Some Validations on Chile

Face to Face: Vortex SERIES vs National Network

Ensemble statistics for R2 Correlation
24 series, 8 sites x 3 drivers (multisource)

	p50	p75	p90
Day:	0.68	0.73	0.80
Mon:	0.72	0.82	0.90

Some Validations on Chile

Face to Face: Vortex SERIES vs National Network

Ensemble statistics for **DAILY** R2 Correlation
8 sites

Driver	p50	p75	p90
MERRA:	0.61	0.68	0.70
CFSR :	0.68	0.74	0.77
ERAI :	0.70	0.82	0.86

Some Validations on Chile

Face to Face: Vortex SERIES vs National Network

Ensemble statistics for **DAILY** R2 Correlation
8 sites

Driver	p50	p75	p90
MERRA:	0.61	0.68	0.70
CFSR :	0.68	0.74	0.77
ERAI :	0.70	0.82	0.86

Some Validations on Chile

Face to Face: Vortex SERIES vs National Network

Ensemble statistics for **MONTLY** R2 Correlation
8 sites

Driver	p50	p75	p90
MERRA:	0.89	0.93	0.95
CFSR :	0.89	0.92	0.95
ERAI :	0.87	0.94	0.96

Some Validations on Chile

Face to Face: Vortex SERIES vs National Network

Conclusions: from the positive side

1. Daily coherence with Observations is very decent
2. Monthly coherence is on the top (for instance, UK P50 ~ 0.85)
3. Seasonality seems to be captured (values are affected by months length, 12 for one year data)

Usage and recommendations

Can we use model data in standard MCP methods? Which are the MCP recommended methods? Which are the alternatives? How assess the uncertainty figures (sd) to add to my yield calculations? Which is the associated uncertainty of the model data? What to do when different sources lead to different long-term estimations? How to deal with inconsistency concerns? Is there anyway to standardize usage?

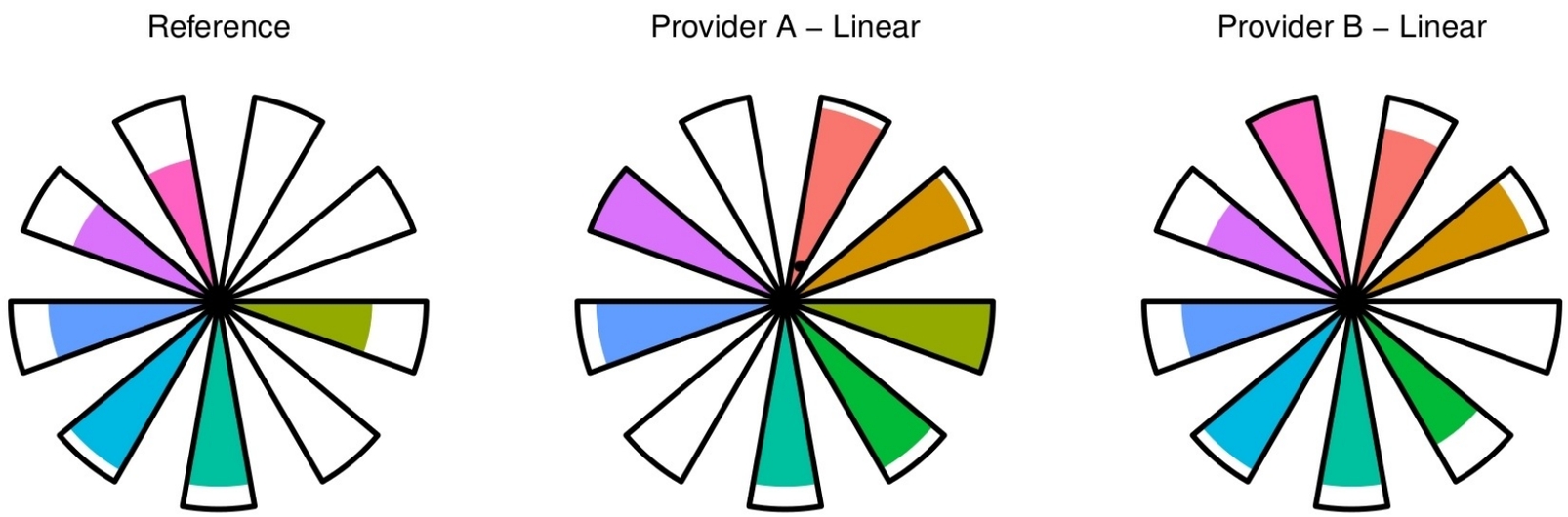
Usage and recommendations

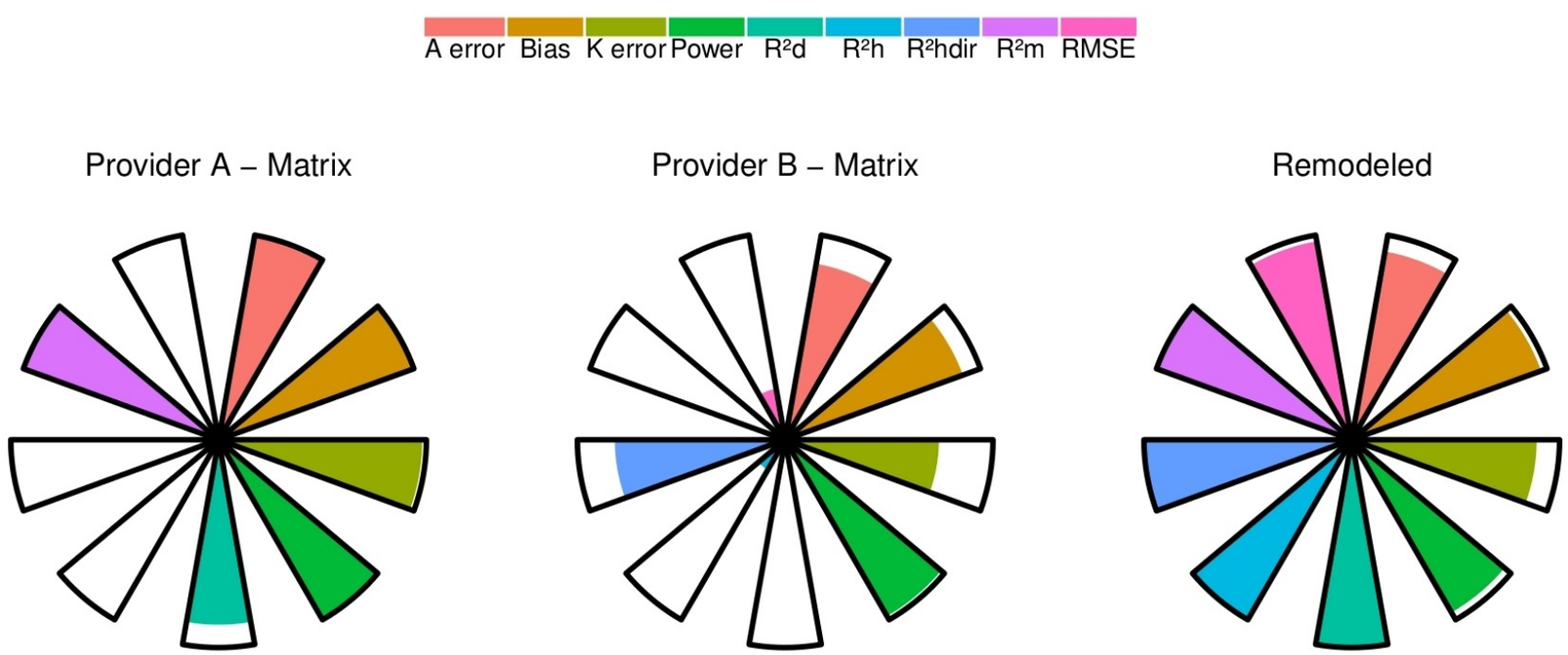
Move to Model bias correction methods

Use a larger set of data from the model (not just sfc winds)

Employ adapted statistical methods (denoise & class)

Usage and recommendations





Vortex Remodeling

1 year training with observations
4 years validations

Further actions

End-users: Inter comparative exercise using National Network (similar to EWEA initiative) - do we have enough data?

Knowledge: Model performance in North Chile

Knowledge: North Chile Climate Analysis (retrospective and future climates/trends)