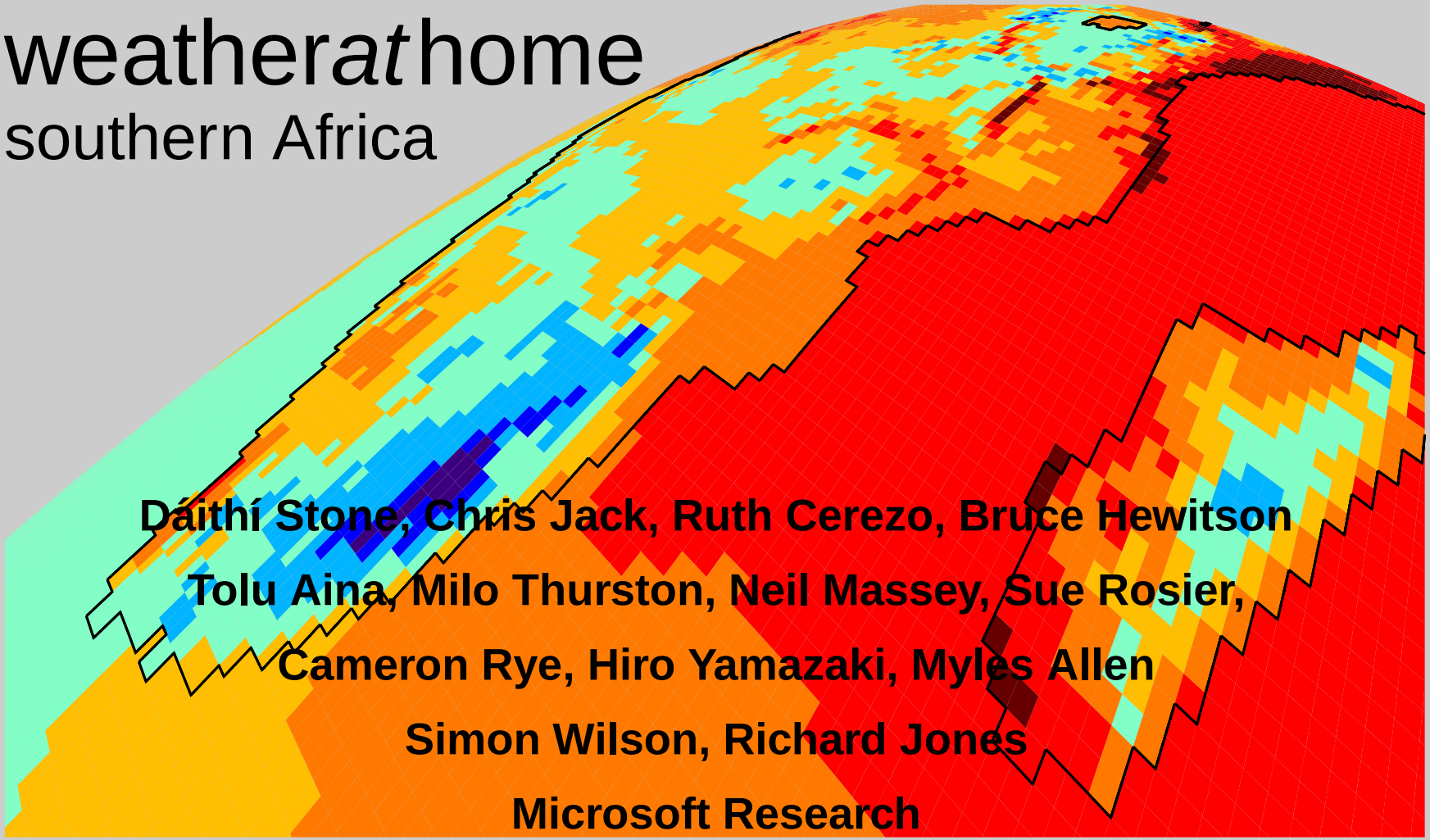
weather*at*home
southern Africa



Dáithí Stone, Chris Jack, Ruth Cerezo, Bruce Hewitson

Tolu Aina, Milo Thurston, Neil Massey, Sue Rosier,

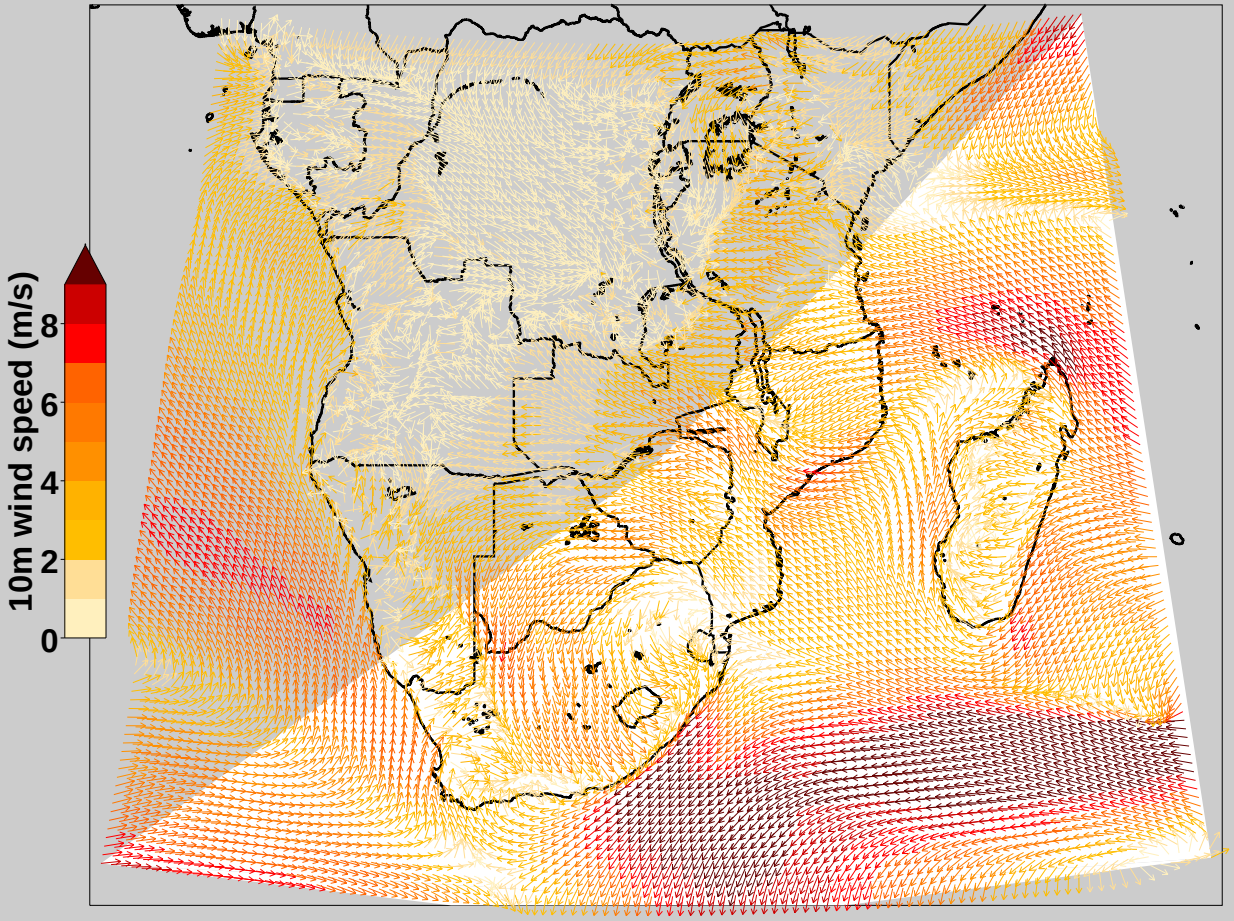
Cameron Rye, Hiro Yamazaki, Myles Allen

Simon Wilson, Richard Jones

Microsoft Research

A large ensemble regional downscaling project

- Global atmospheric model HadAM3P run at N96 ($\sim$150km)
- Embedded regional model HadRM3P run at 0.44^{o}($\sim$50km)
- RCM run over southern African domain
  (separately over western U.S.A. and over Europe)
- Run through the climate*prediction*.net facility
  - Volunteers around the world run on home PCs
  - Currently $\sim$50 000 PCs actively running climate*prediction*.net


10m wind speed (m/s)
0
2
4
6
8

Simulations

- Each simulation run over 12 month period, starting 1 December through 30 November
- Takes about 4 days to complete running full time on a 2.4GHz computer
- Simulations starting December 1959 up to December 2006
- At the end, each simulation returns a restart dump
  - Producing continuous sequences of simulations
  - Currently means restriction to MS Windows systems
- Forced with observed SSTs and radiative forcings (via aerosol emissions)

Uploaded output

Daily regional

CMIP	Description	Levels
tasmax	Maximum daily temperature	1.5m
tasmin	Minimum daily temperature	1.5m
pr	Precipitation rate	Surface
uas	Zonal wind speed	10m
vas	Meridional wind speed	10m
-	Dewpoint temperature	1.5m
zg	Geopotential height	700, 500hPa
ta	Air temperature	850hPa
ua	Zonal wind speed	850hPa
va	Meridional wind speed	850hPa
hur	Relative humidity	850hPa

Monthly regional

CMIP	Description	Levels
psl	Mean pressure	Sea level
tas	Mean air temperature	1.5m
-	Cloud below 1000 feet above sea level	-
pr	Mean precipitation rate	Surface
-	Available soil moisture content	-
hfls	Latent heat flux	Surface
-	Total downward shortwave flux	Surface

Monthly Global

CMIP	Description	Levels
zg	Geopotential height	500hPa
psl	Air pressure	Mean sea level
tas	Air temperature	1.5m
ta	Air temperature	500hPa
ts	Surface skin temperature	Surface
-	Dewpoint temperature	1.5m
uas	Zonal wind speed	10m
ua	Zonal wind speed	850, 500, 200hPa
vas	Meridional wind speed	10m
va	Meridional wind speed	850, 500, 200hPa
hur	Relative humidity	1.5m
hur	Relative humidity	500hPa
pr	Precipitation rate	Surface
-	Available soil moisture content	
-	Surface and boundary layer heat fluxes	-
hfls	Latent heat flux	Surface
-	Net downward shortwave flux	Surface
-	Net downward longwave flux	Surface
rsut	Outgoing shortwave flux	Top of atmosphere
rlut	Outgoing longwave flux	Top of atmosphere
rsutcs	Clear-sky upward shortwave flux	Top of atmosphere
rlutcs	Clear-sky upward longwave flux	Top of atmosphere

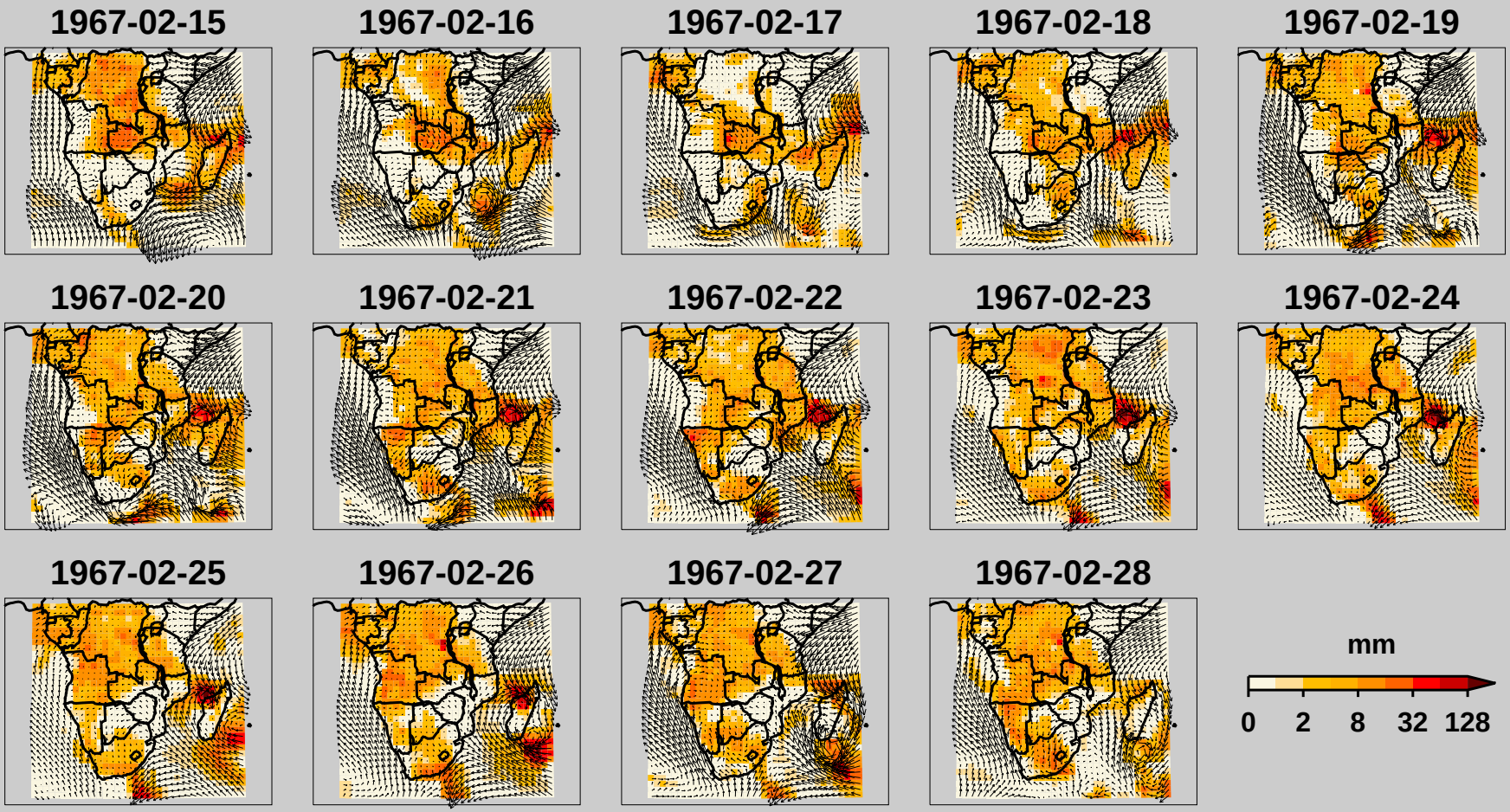
Grids for uploaded output

7.04^{o}E 5.47^{o}N	7.44^{o}E 5.42^{o}N	7.85^{o}E 5.37^{o}N	...	49.65^{o}E 5.53^{o}N	50.06^{o}E 5.59^{o}N	50.46^{o}E 5.64^{o}N	50.86^{o}E 5.69^{o}N	51.27^{o}E 5.75^{o}N
6.98^{o}E 5.03^{o}N	7.39^{o}E 4.98^{o}N	7.80^{o}E 4.93^{o}N	...	49.71^{o}E 5.10^{o}N	50.11^{o}E 5.15^{o}N	50.52^{o}E 5.20^{o}N	50.92^{o}E 5.26^{o}N	51.33^{o}E 5.31^{o}N
6.93^{o}E 4.59^{o}N	7.36^{o}E 4.54^{o}N	7.74^{o}E 4.49^{o}N	...	49.77^{o}E 4.67^{o}N	50.17^{o}E 4.71^{o}N	50.58^{o}E 4.77^{o}N	50.98^{o}E 4.82^{o}N	51.39^{o}E 4.88^{o}N
⋮	⋮	⋮	⋱	⋮	⋮	⋮	⋮	⋮
1.07^{o}E 36.40^{o}S	1.58^{o}E 36.47^{o}S	2.09^{o}E 36.53^{o}S	...	55.77^{o}E 36.32^{o}S	56.27^{o}E 36.25^{o}S	56.78^{o}E 36.18^{o}S	57.29^{o}E 36.11^{o}S	57.80^{o}E 36.04^{o}S
0.98^{o}E 36.84^{o}S	1.50^{o}E 36.90^{o}S	2.01^{o}E 36.96^{o}S	...	55.85^{o}E 36.75^{o}S	56.36^{o}E 36.68^{o}S	56.87^{o}E 36.62^{o}S	57.38^{o}E 36.55^{o}S	57.89^{o}E 36.48^{o}S
0.90^{o}E 37.27^{o}S	1.41^{o}E 37.34^{o}S	1.92^{o}E 37.46^{o}S	...	55.94^{o}E 37.18^{o}S	56.45^{o}E 37.12^{o}S	56.96^{o}E 37.05^{o}S	57.47^{o}E 36.98^{o}S	57.98^{o}E 36.91^{o}S
0.81^{o}E 37.71^{o}S	1.33^{o}E 37.77^{o}S	1.84^{o}E 37.90^{o}S	...	56.03^{o}E 37.62^{o}S	56.54^{o}E 37.55^{o}S	57.05^{o}E 37.48^{o}S	57.56^{o}E 37.42^{o}S	58.07^{o}E 37.35^{o}S

Bandwidth usage

- Download is about 130MB the first simulation
  - Much smaller for subsequent simulations because many required files already downloaded
- 3.5MB uploaded at the end of each simulation month containing output
- 32MB restart dump uploaded at the end of the simulation year
- Total of 74MB upload per simulation

Problems with “tropical cyclones”



Plans

- Start with a large initial condition ensemble (¿100, maybe $\sim$1000)
  - Seasonal predictability
  - Trends in weather risk
  - Interpolation surface for interpolating observations
- Attribution ensembles
  - Reduce GHG, aerosol concentrations to pre-industrial levels
  - Cool ocean surface accordingly
- Perturbed parameter ensembles
  - Repeat above with different parameter sets
- Prediction $\sim$10 years into future