

Short-segment model: early results for Africa + Arctic

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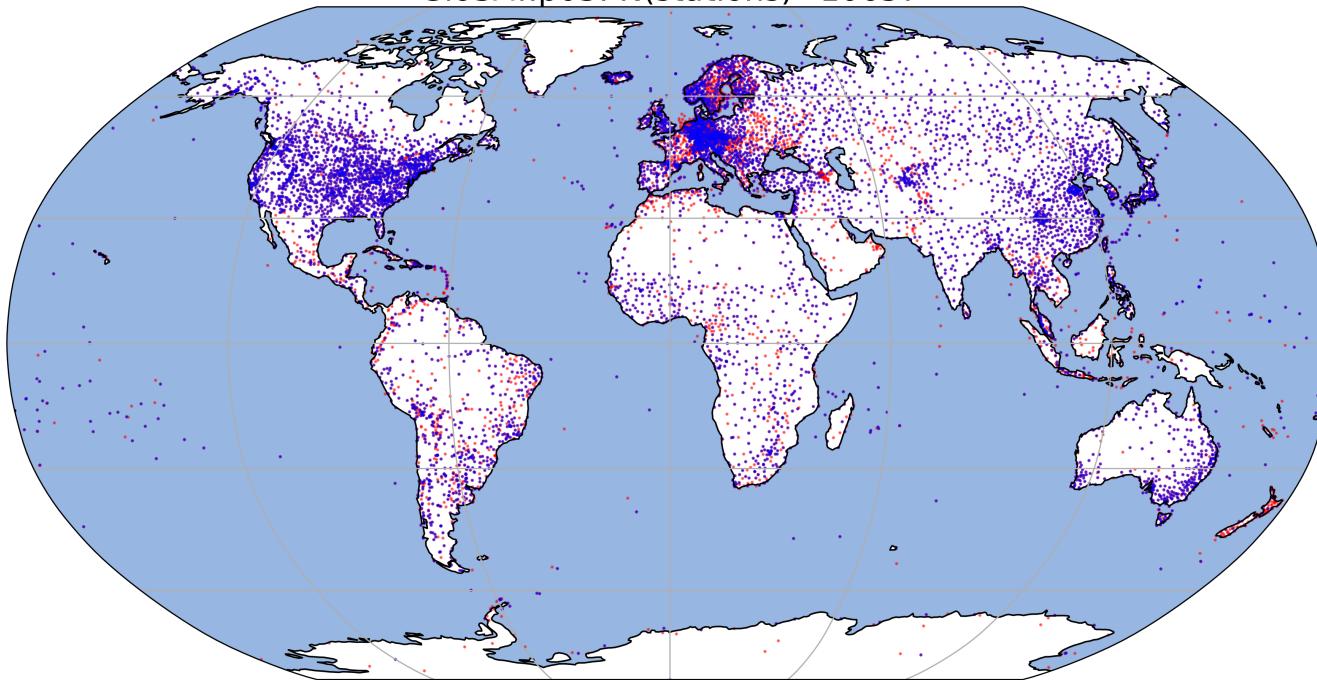
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GloSAT.p03 absolute temperature series

2816 out of 10657 stations not currently contributing anomalies (yet!)

GloSAT.p03: N(stations)=10657

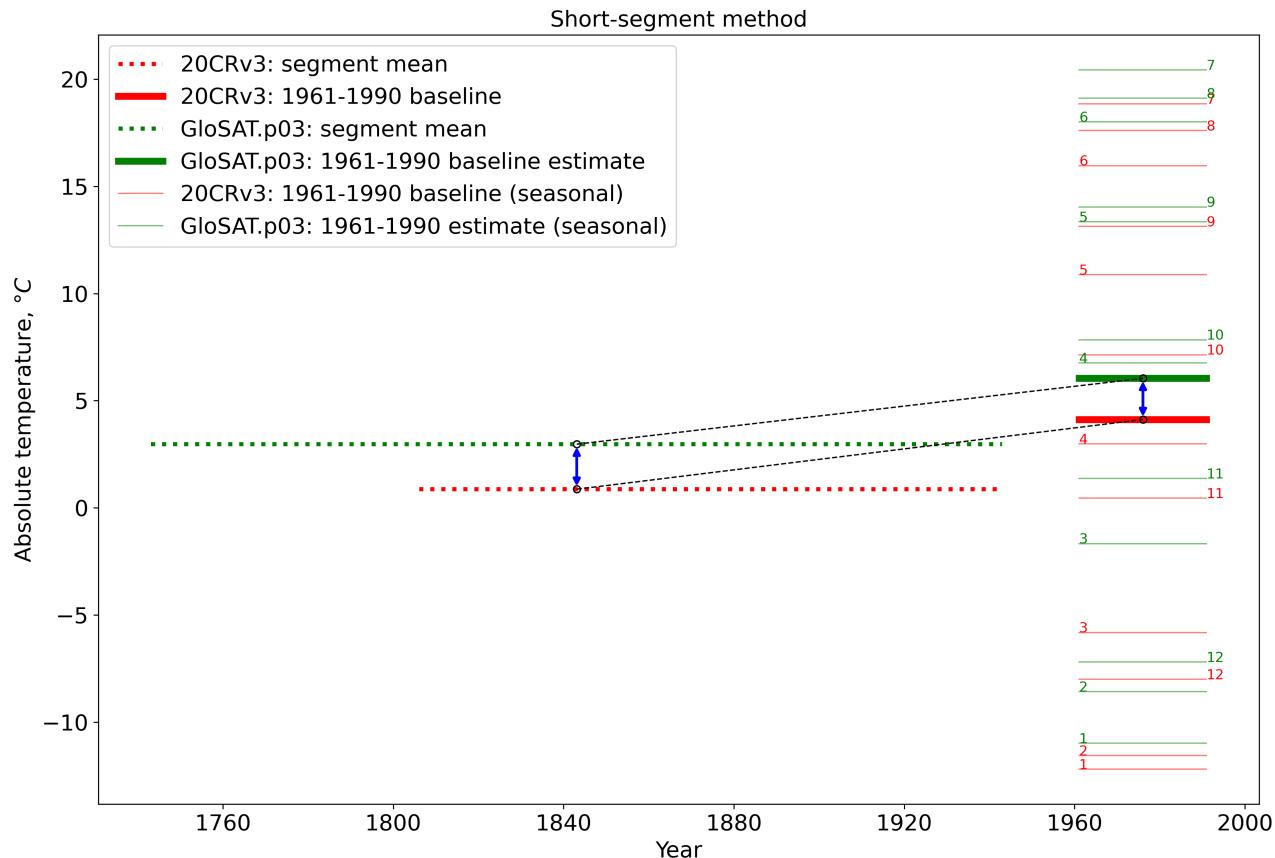


2618 stations not currently contributing anomalies because they don't have a 1961-1990 baseline normal

- Global: N(short-segment stations)=2618
- Global: N(stations with 1961-1990 normals)=8039

Short-segment method

Linear model to shift segment level using 20CRv3 nearest gridcell extract

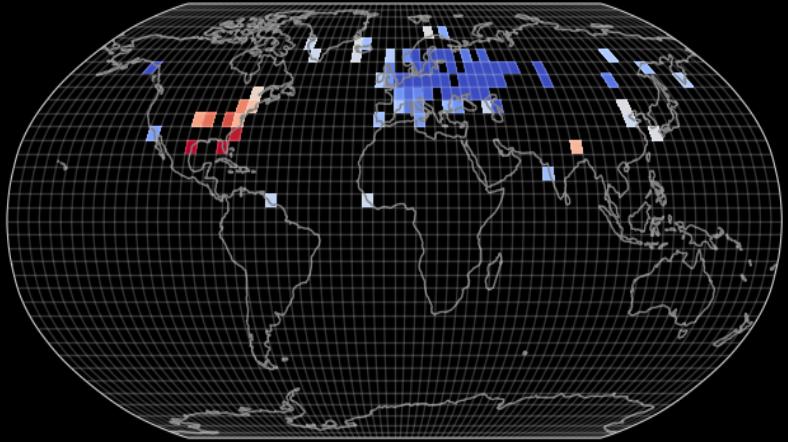


$$\text{Station Normal (1961-1990)} = \text{Station Mean (segment)} - 20\text{CRv3 Mean (segment)} + 20\text{CRv3 Normal (1961-1990)}$$

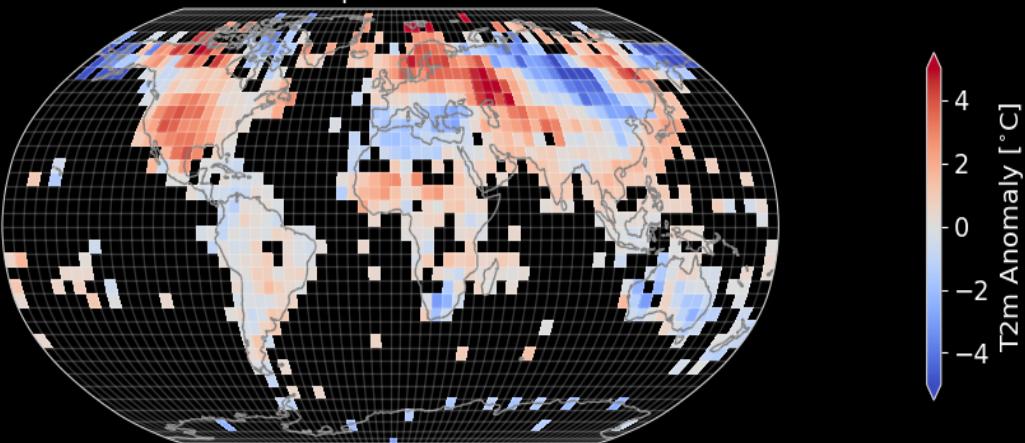
20CRv3 v GloSAT.p03

Spatial coverage comparison for early and recent epochs

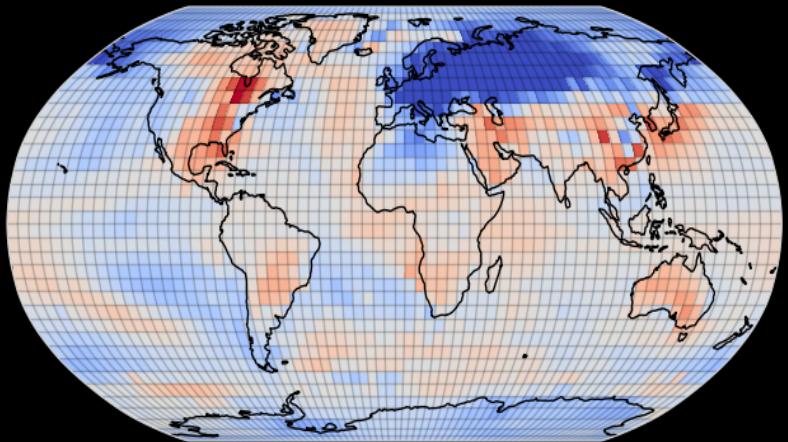
GloSAT.p03: **1850 – 01**



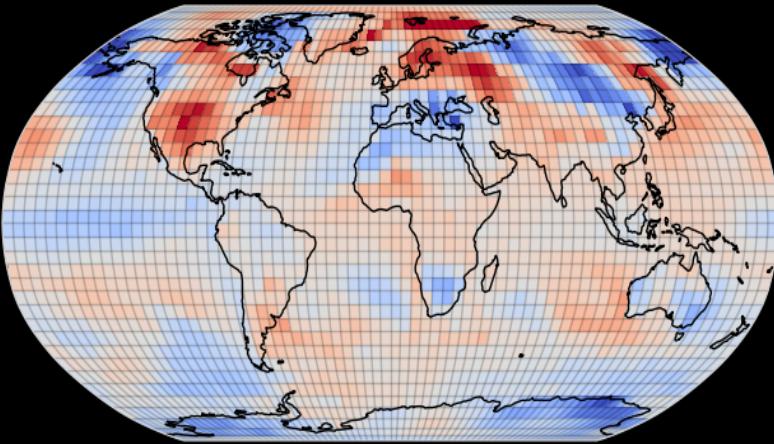
GloSAT.p03: **2000 – 01**



20CRv3: **1850 – 01**

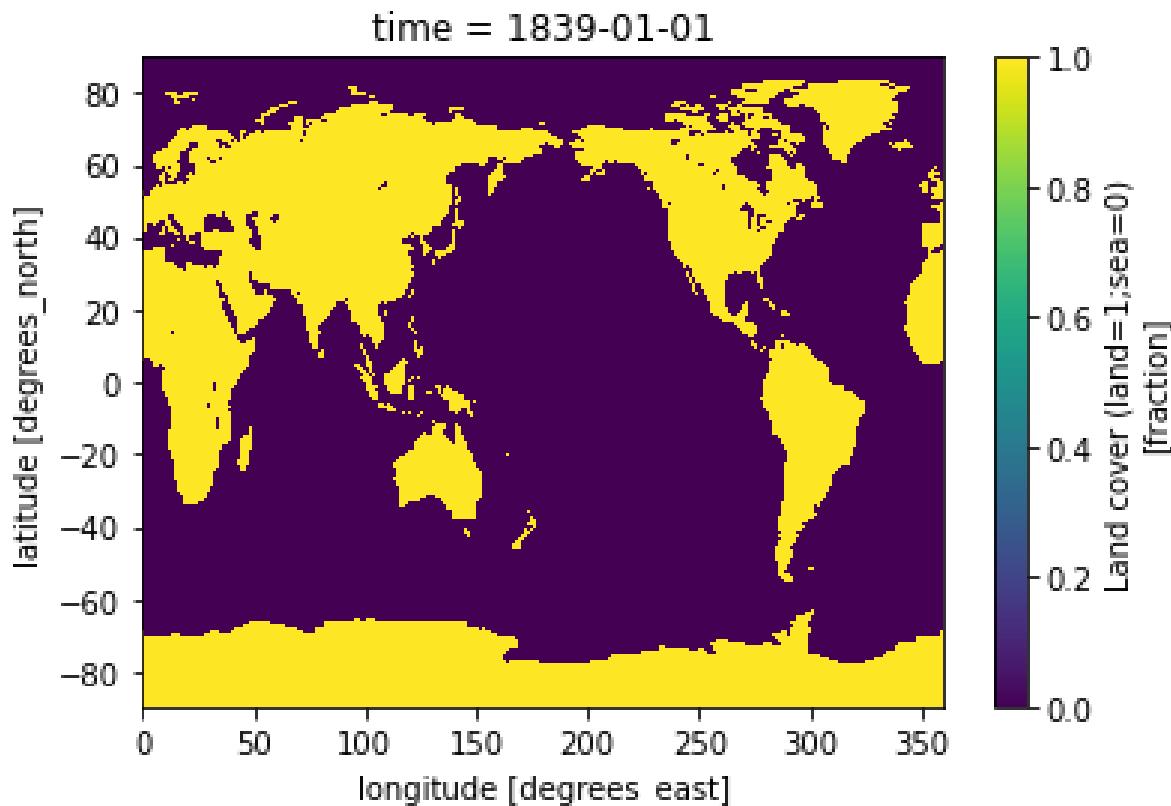


20CRv3: **2000 – 01**



Continental background reanalysis level

We use the land/sea mask + GeoPandas to extract continent gridcells for ensemble



20CRv3 land/sea mask
(native resolution = 0.7°):

Applied to Africa + Arctic
Applied to 80 ensemble
members
→ median & 5-95% c.i.

(aside) CDO is the best

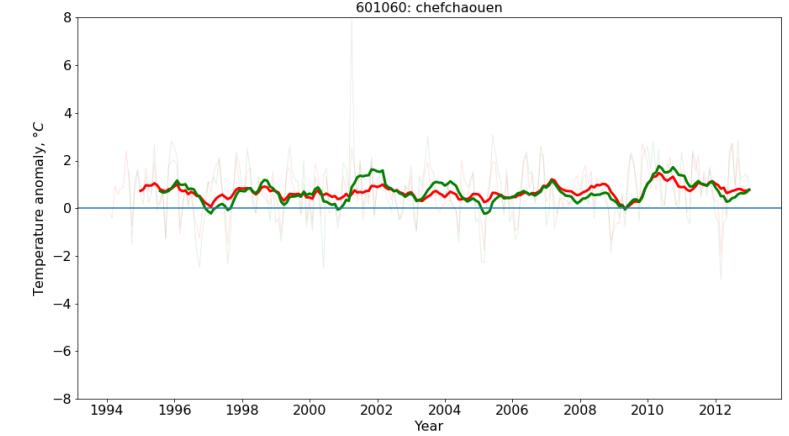
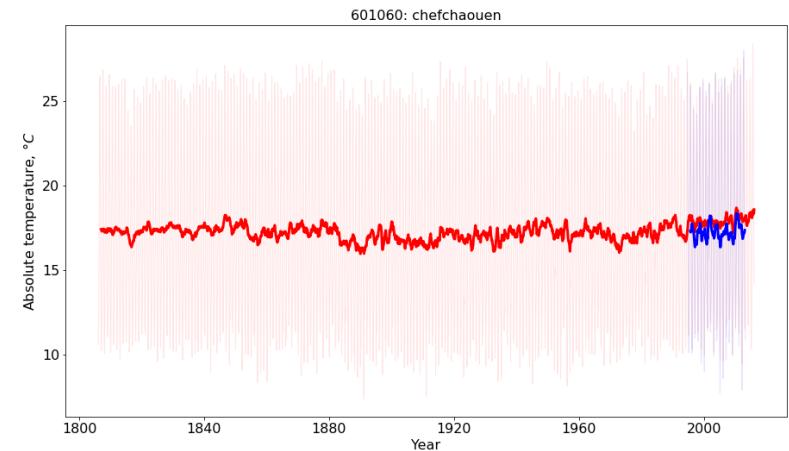
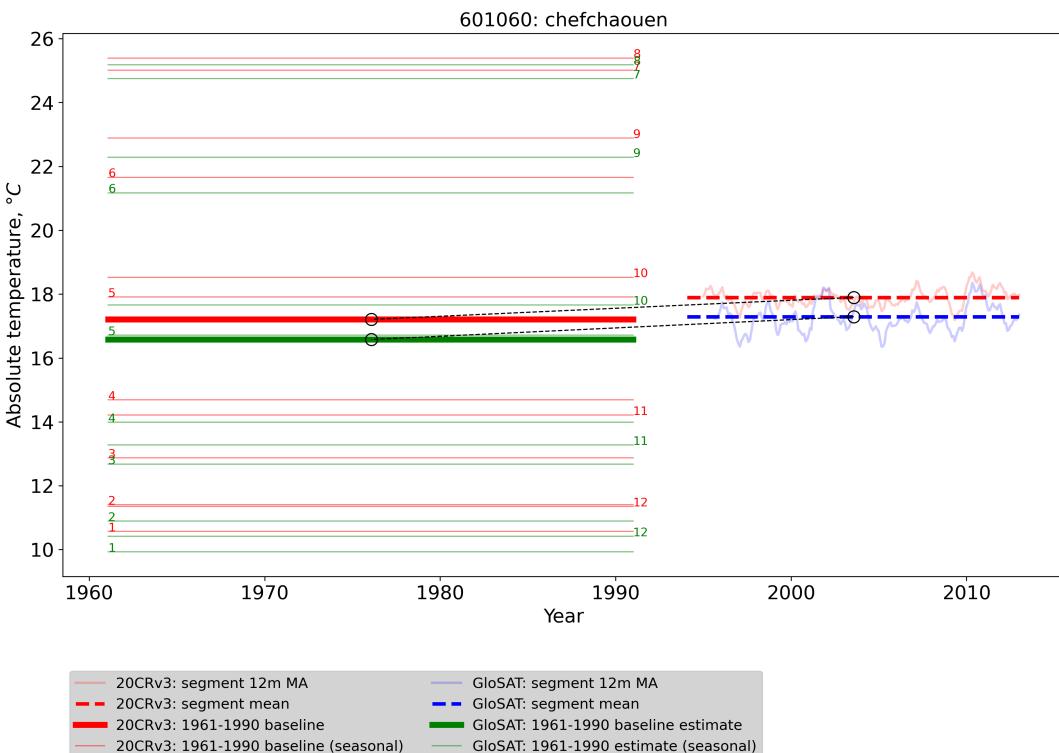
```
$ cdo -map -invertlat -topo,r72x36
```

I didn't know CDO could do this at the command line!

Very helpful for checking
masking

EXAMPLE

A single station – segment after 1990

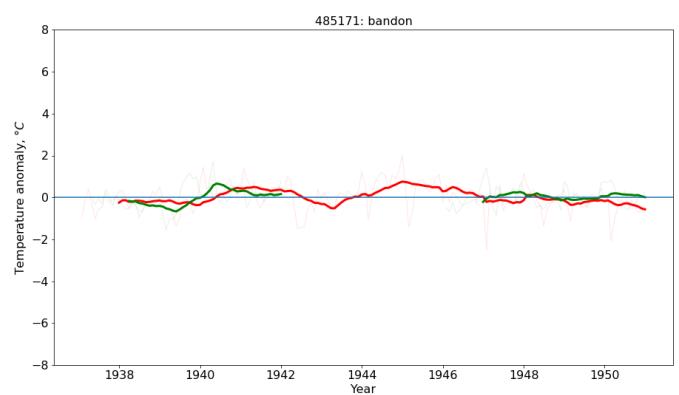
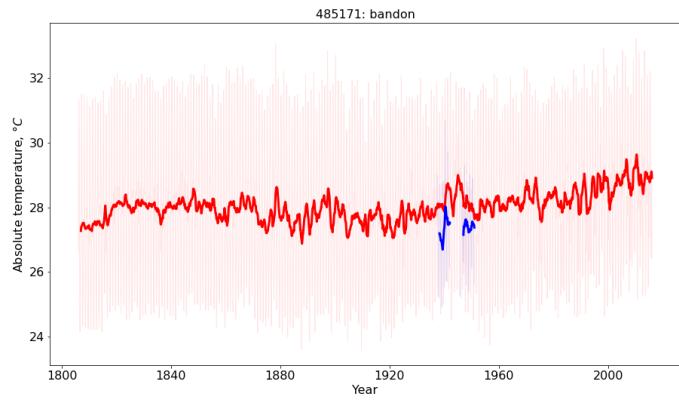
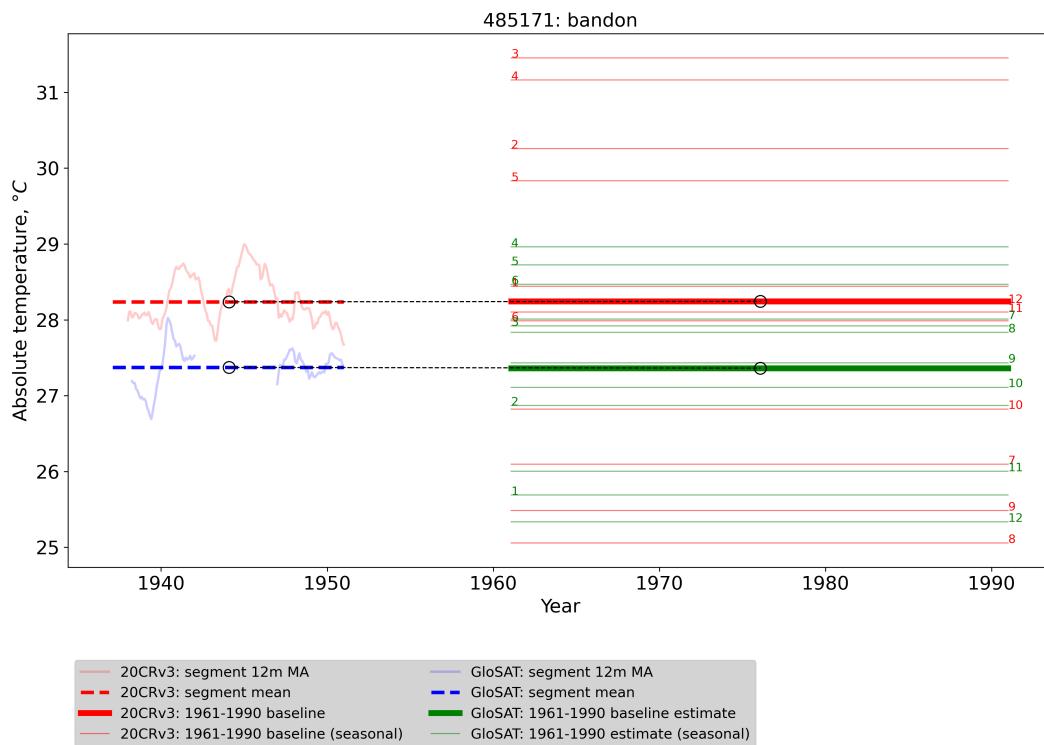


Segment wholly outside and after the 1961-1990 window

20CRv3: 12m MA
model: 12m MA

EXAMPLE

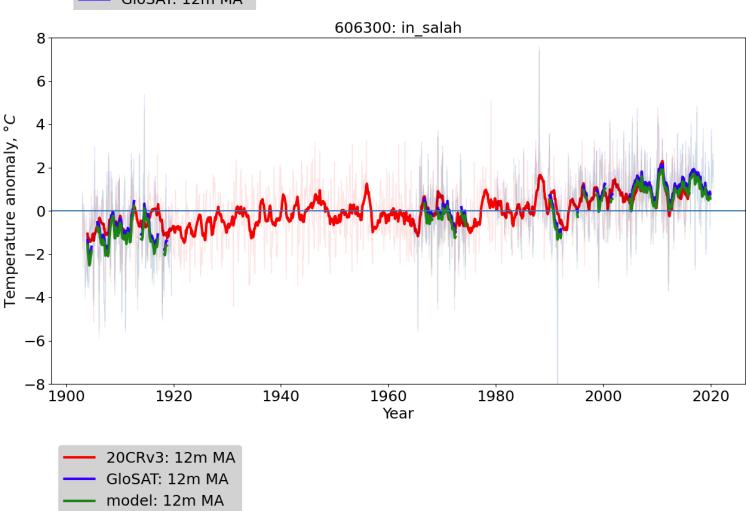
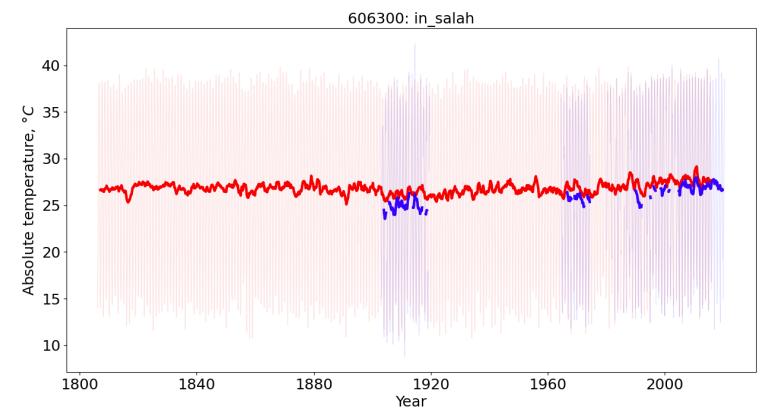
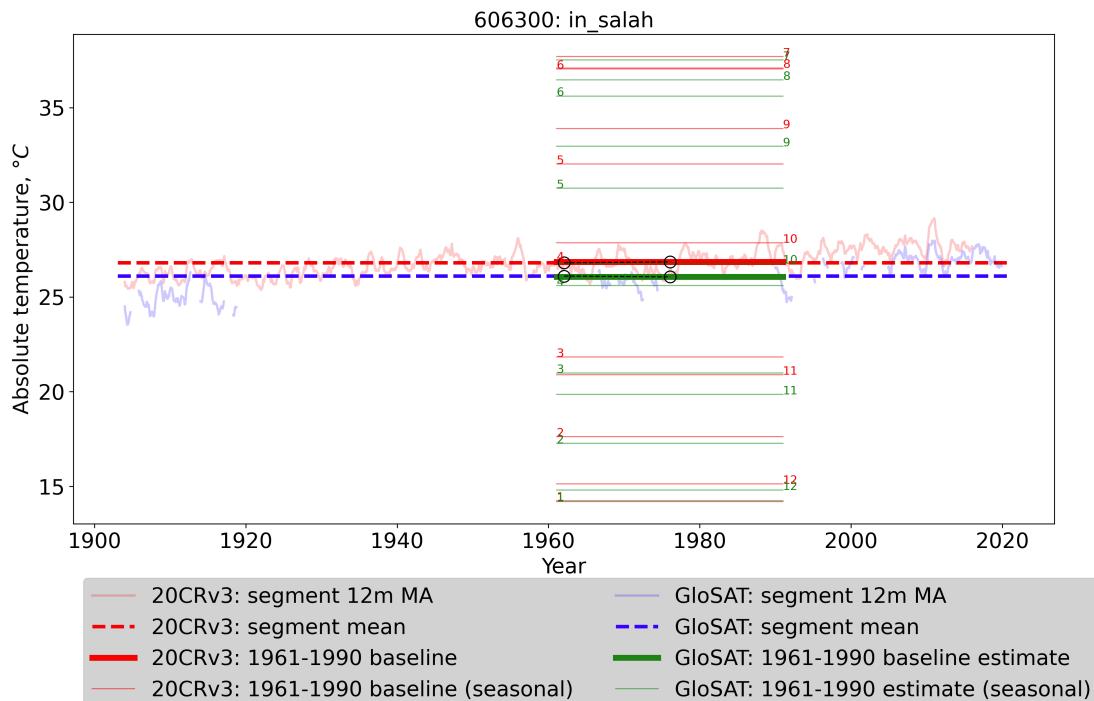
A single station – segment before 1961



Segment wholly outside and before the 1961-1990 window

EXAMPLE

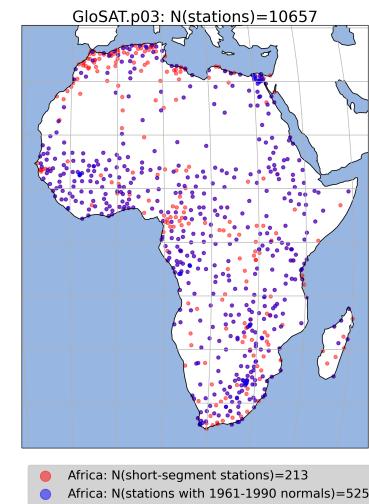
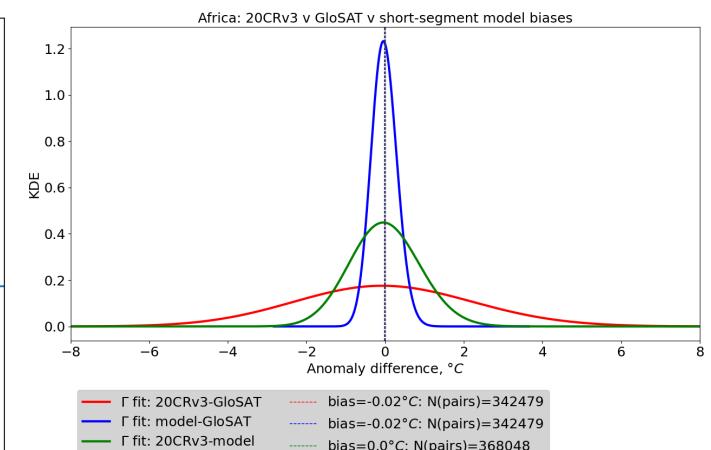
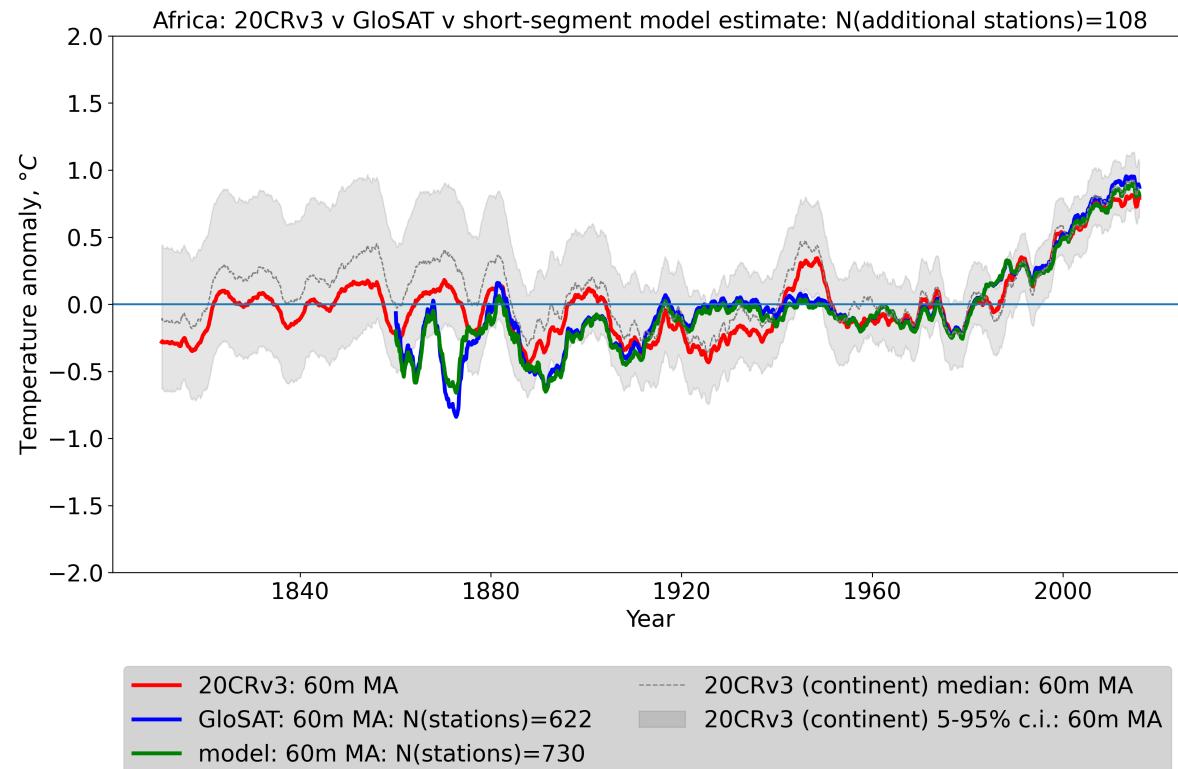
A single station – multiple segments



Multiple segments all over the place

Africa

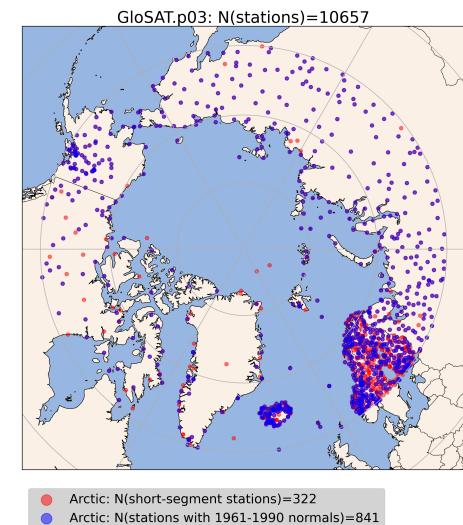
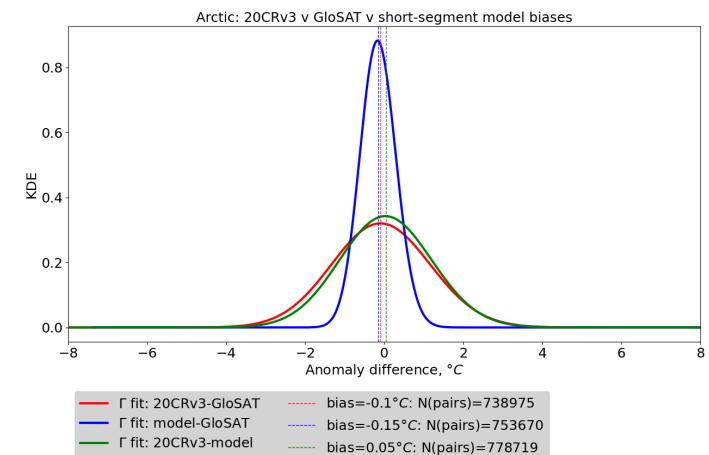
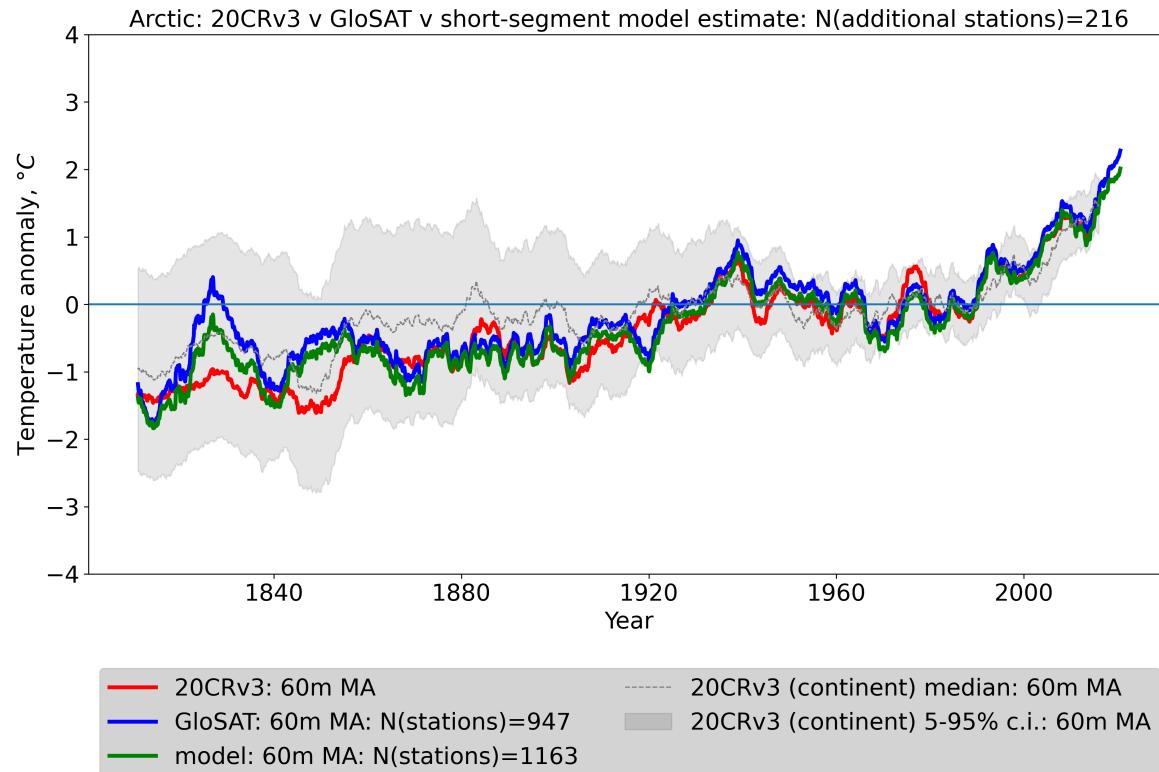
Comparison with regional 20CRv3 (land-masked) – all African stations



- Gridcell extracted 20CRv3 (red) not converging on continent-level land-masked 20CRv3 (grey) before 1950
- Station and reanalysis diverging 1890-1950. Why ? Is it exposure bias ?
- Reanalysis pre-1880 driven by extrapolated SSTs – unreliable here ?

Arctic

Comparison with regional 20CRv3 (land-masked) – all Arctic stations



- Gridcell extracted 20CRv3 (red) not converging on continent-level land-masked 20CRv3 (grey) anywhere! Why ?
- Station and reanalysis diverging 1920 – need more data / other reasons ?
- Reanalysis sensitive to sea-ice uncertainty ?

Many thanks

NOAA / PSL

For providing 20CRv3 1806-2015:

https://portal.nersc.gov/project/20C_Reanalysis/

CRU / UEA

For providing CRUTEM5 land surface air temperature instrumental data 1781-2020:

<https://crudata.uea.ac.uk/cru/data/temperature/>

GloSAT project

<https://www.glosat.org/>

Codebase:

<https://github.com/patternizer/glosat-short-segments>