Short-segment model: early results for Africa + Arctic

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GloSAT.p03 absolute temperature series

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



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



Station Normal (1961-1990) = Station Mean (segment) – 20CRv3 Mean (segment) + 20CRv3 Normal (1961-1990)





20CRv3 v GloSAT.p03

Spatial coverage comparison for early and recent epochs







Continental background reanalysis level

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

time = 1839-01-01 1.080 60 0.8 🔒 latitude [degrees_north] 40 20 0.6 action cover (land= 0 -20 · 0.4 0.2 Pup -40 20CRv3 land/sea mask -60(native resolution $= 0.7^{\circ}$): -800.0 Applied to Africa + Arctic 50 200 250300 350 100 1500 Applied to 80 ensemble longitude [degrees east]

→ median & 5-95% c.i.

members



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(aside) CDO is the best

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\$ 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 <u>after</u> 1990







EXAMPLE A single station – segment <u>before</u> 1961



Segment wholly outside and **before** the 1961-1990 window









EXAMPLE A single station – <u>multiple segments</u>







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



- Station and reanalysis diverging 1890-1950. Why ? Is it exposure bias ?
- Reanalysis pre-1880 driven by extrapolated SSTs unreliable here ?

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Africa: N(short-segment stations)=213 Africa: N(stations with 1961-1990 normals)=525

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



- Station and reanalysis diverging 1920 need more data / other reasons?
- Reanalysis sensitive to sea-ice uncertainty?

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Arctic: N(short-segment stations)=322 Arctic: N(stations with 1961-1990 normals)=841



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



