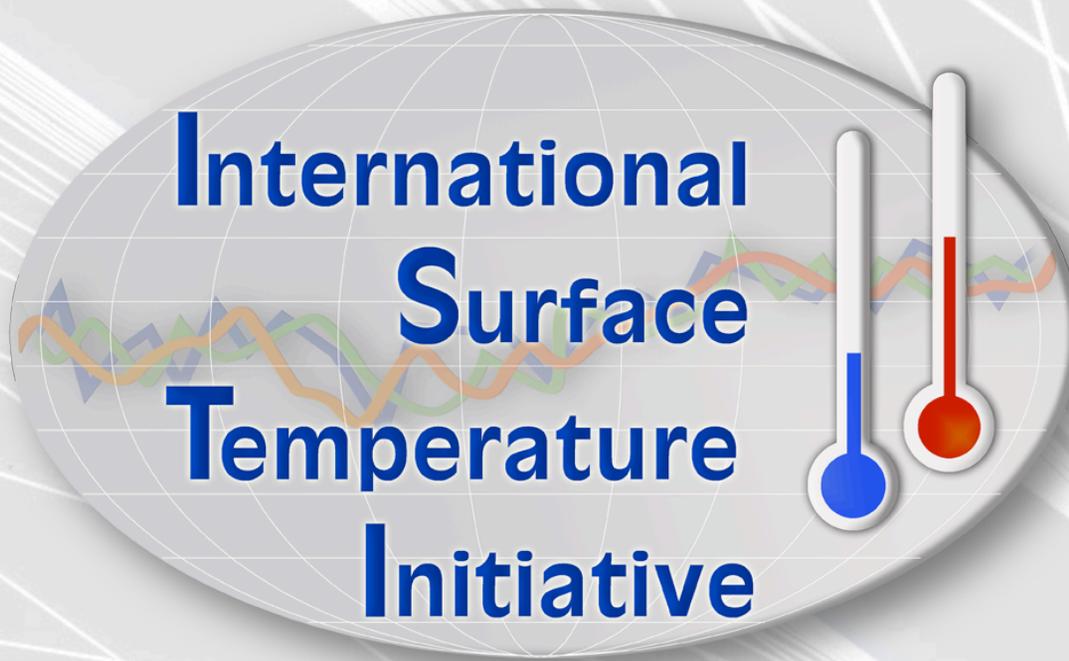


The International Surface Temperature Initiative: An Overview

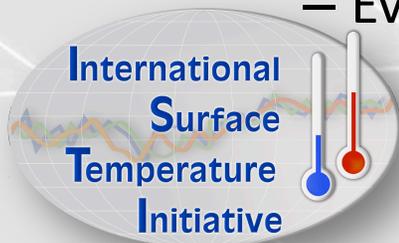


10/25/11

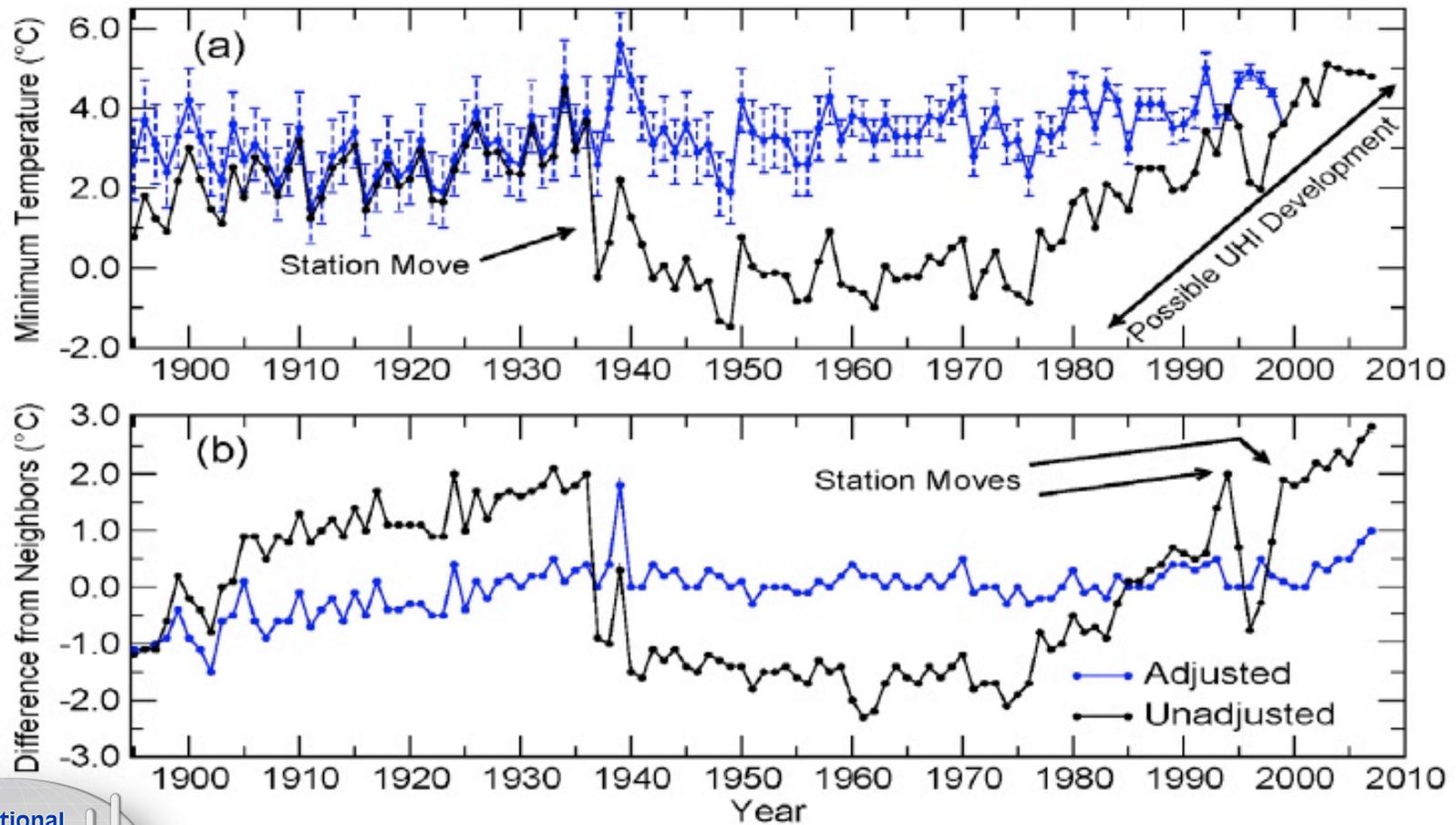
Peter Thorne, CICS-NC, on behalf of initiative participants

Background

- Several independent global estimates of Land Surface Air Temperatures
 - Independently produced
 - Gross agreement at hemispheric / global scales on all timescales, however ...
 - Process metadata in some cases missing
 - Much of the work was undertaken in late 1980's/ early 1990's - technology and expectations have changed since then
 - Monthly large scale gridbox averages only (generally)
 - Many data issues in the raw data
 - Even more critiques (esp. in blogs)



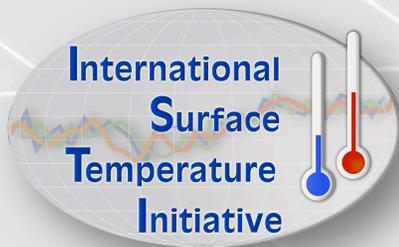
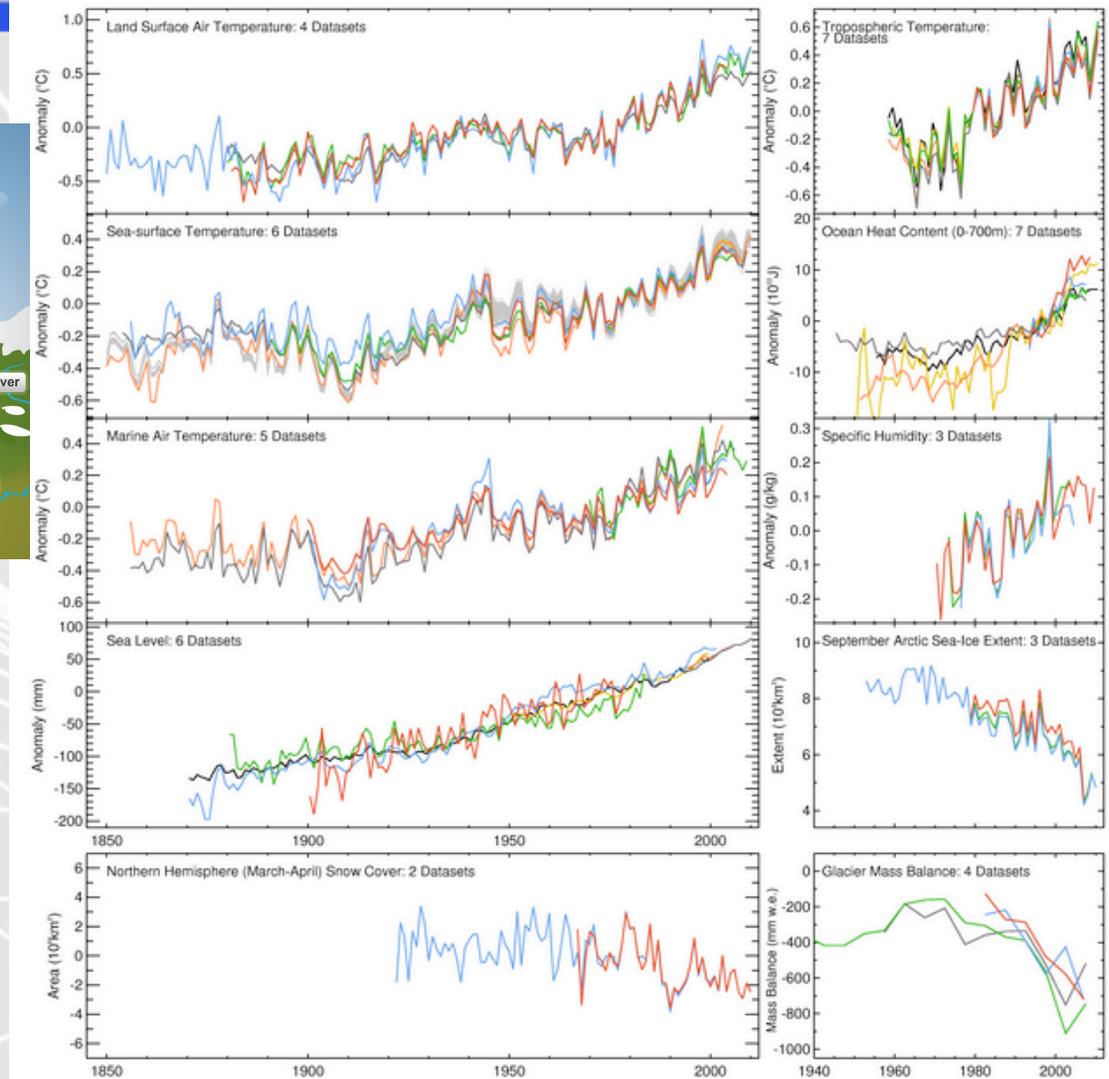
Inhomogeneities: annual mean minimum temperature at Reno, Nevada, USA



No doubt that it is warming – the rate and temporal / spatial details are the issue

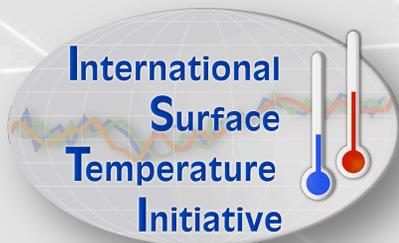


(NCDC Graphics Team (above), John Kennedy, Met Office Hadley Centre (right))



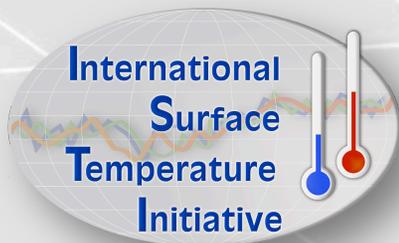
The big question

- Can we create a process that leads to a suite of well characterized estimates of land surface temperatures that can be used to answer scientific questions and societal demands of the 21st Century?
 - Open and transparent
 - Better understanding of fundamental instrument performance and measurement properties
 - Consistent performance evaluation of a larger suite of estimates to better explore methodological uncertainty
 - User tools
 - Not just monthly at the largest scales. Daily, sub-daily, regional and local



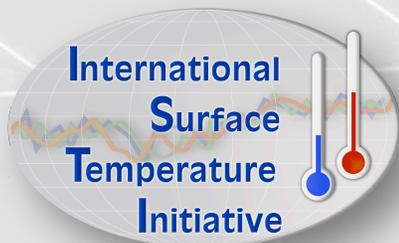
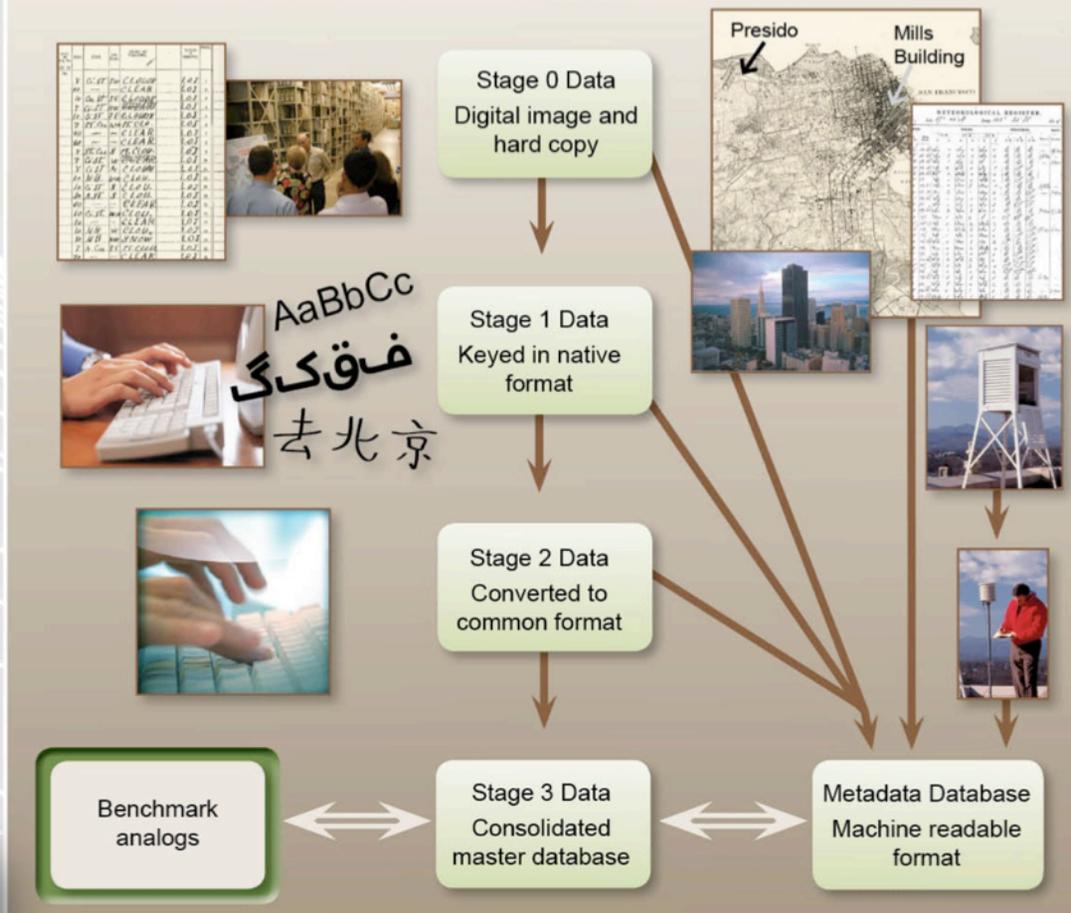
Who are 'we'?

- Initiative was started at a meeting at the UK Met Office in September 2010 including climate scientists, metrologists, statisticians, software engineers, citizen scientists
- Committees, working groups, and task teams include specialists from these fields and representation from every continent (excl. Antarctica) and relevant programs
- Include strong representation from several groups involved in the issue historically (e.g. NCDC, UKMO)
- Report to WMO, TIES, BIPM



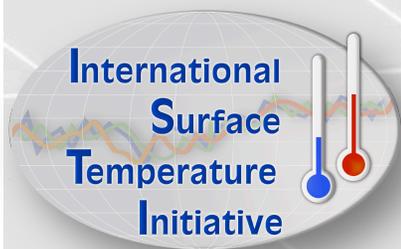
Data rescue and provision

Proposed International Land Meteorological Databank





www.iedro.org



Stage 1 - Native format digitized

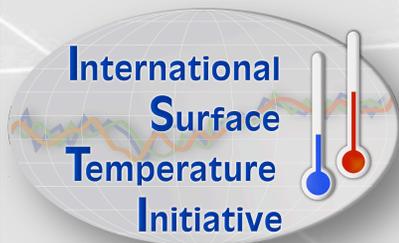


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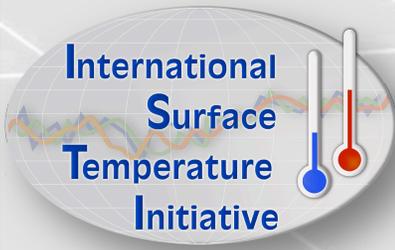
Stage 3

- Same format as stage 2
- One unique version for each station – recommended version for most users
- Forms basis for creation of analogs (see later)
- Protocols used in merging sources are as yet to be finalized
- Provenance tracking will ensure an unbroken chain to earlier stages



Databank Progress

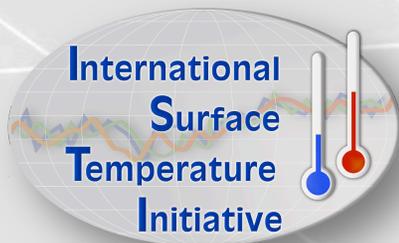
- Working Group instigated
 - Data rescue task team
 - Provenance and version control task team
- Development version posted
 - http://www.gosic.org/GLOBAL_SURFACE_DATABANK/GBD.html
- First version release and accompanying documentation / paper to be submitted spring 2012



Partnerships essential

- Bring together existing efforts, augment and ensure pull through. e.g. ACRE (“Atmospheric Circulation Reconstructions over the Earth”) project (<http://www.met-acre.org/>), International Environmental Data Rescue Organisation (www.iedro.org) and other national / international programs.
- Pursue innovative approaches (crowdsourcing building upon success of www.oldweather.org etc.)
- Build on ICOADS model for sea surface temperatures (<http://icoads.noaa.gov/>) – easy submission and access to data
- And you can also help ...

data.submission@surfacetemperatures.org



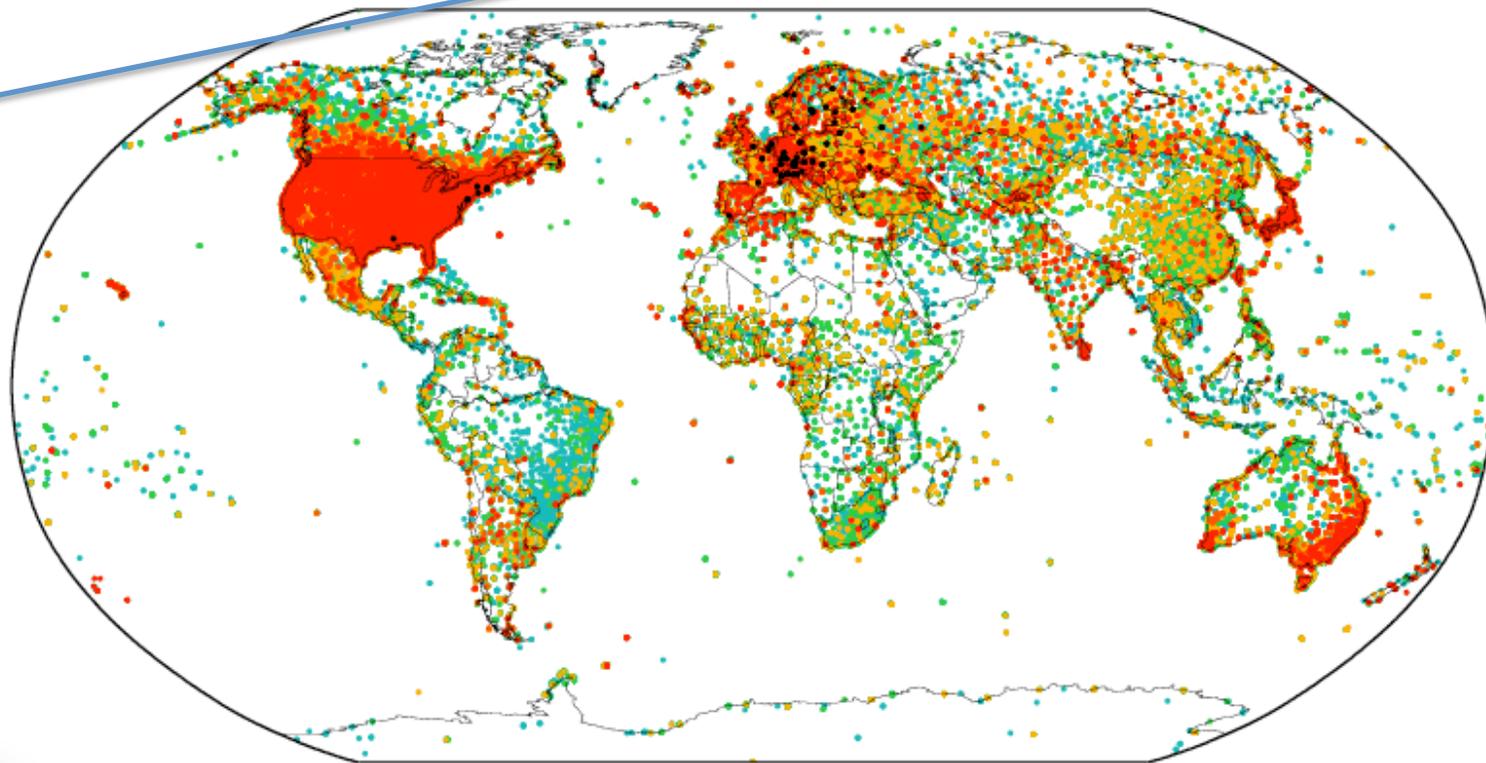
To date ... Stage 2 holdings

Records, NOT stations, there will be a lot of station duplicates or even entire record duplicates!

Jared Rennie,
CICS-NC /
NOAA NCDC

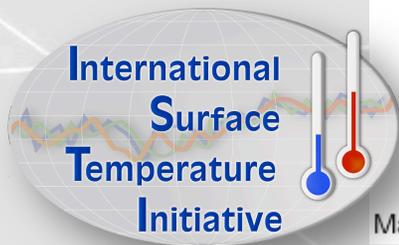
ALL Stage2 monthly (20111021)

Number of NON-UNIQUE Station Records: 133806



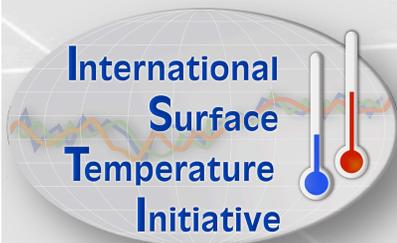
Number of Years

Map generated on 20111021



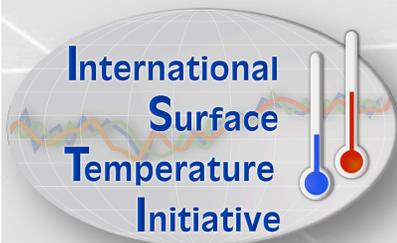
Multiplicity of data products

- Structural uncertainty is the key
 - Raw data is far from traceable to international measurement standards.
 - Data artifacts are numerous and have myriad causes
 - Metadata is patchy at best
 - Data is discrete in both space and time
 - No “how to” ... rather very many cases of “it may work ...”
 - Multiple subjective decisions required even in automated procedures (thresholds, periods, test type etc.)
 - Different approaches may have different strengths and weaknesses
 - No single dataset can answer all user needs

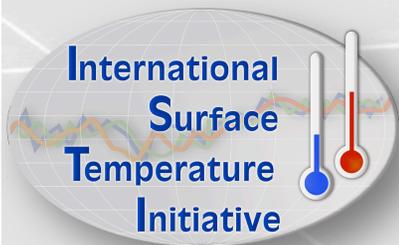
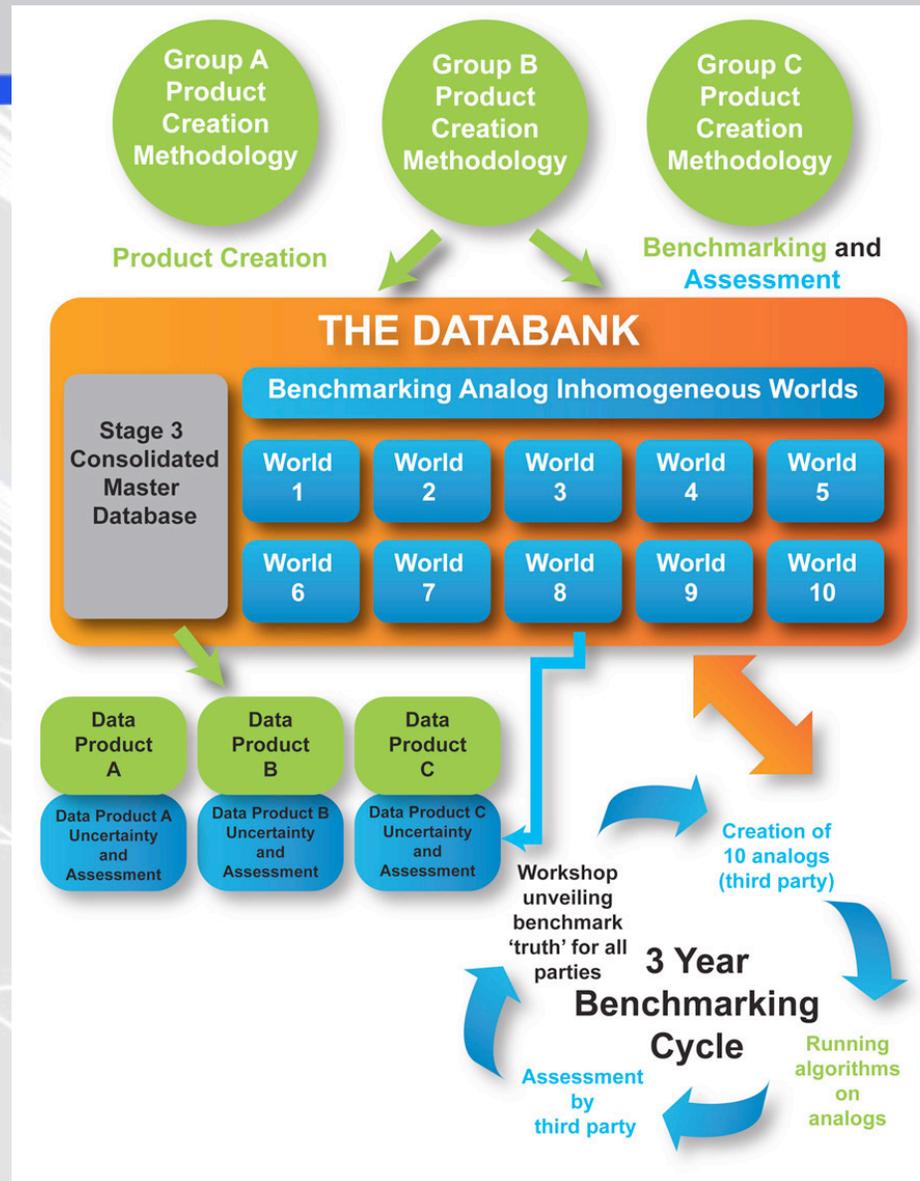


Benchmarking and assessment

- With real world data we do not have the luxury of knowing the truth – we CANNOT measure performance of a specific method or closeness to real world truth of any one data-product.
- We CAN focus on performance of underlying algorithms
- Consistent synthetic test cases, simulating real world noise, variability and spatial correlations potentially enable us to do this

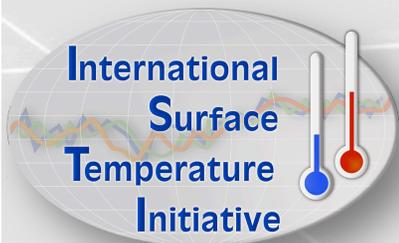


Benchmarking cycle



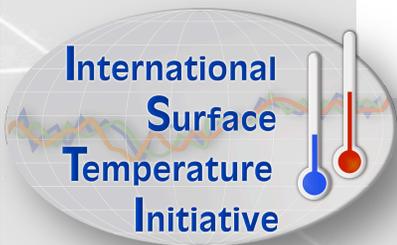
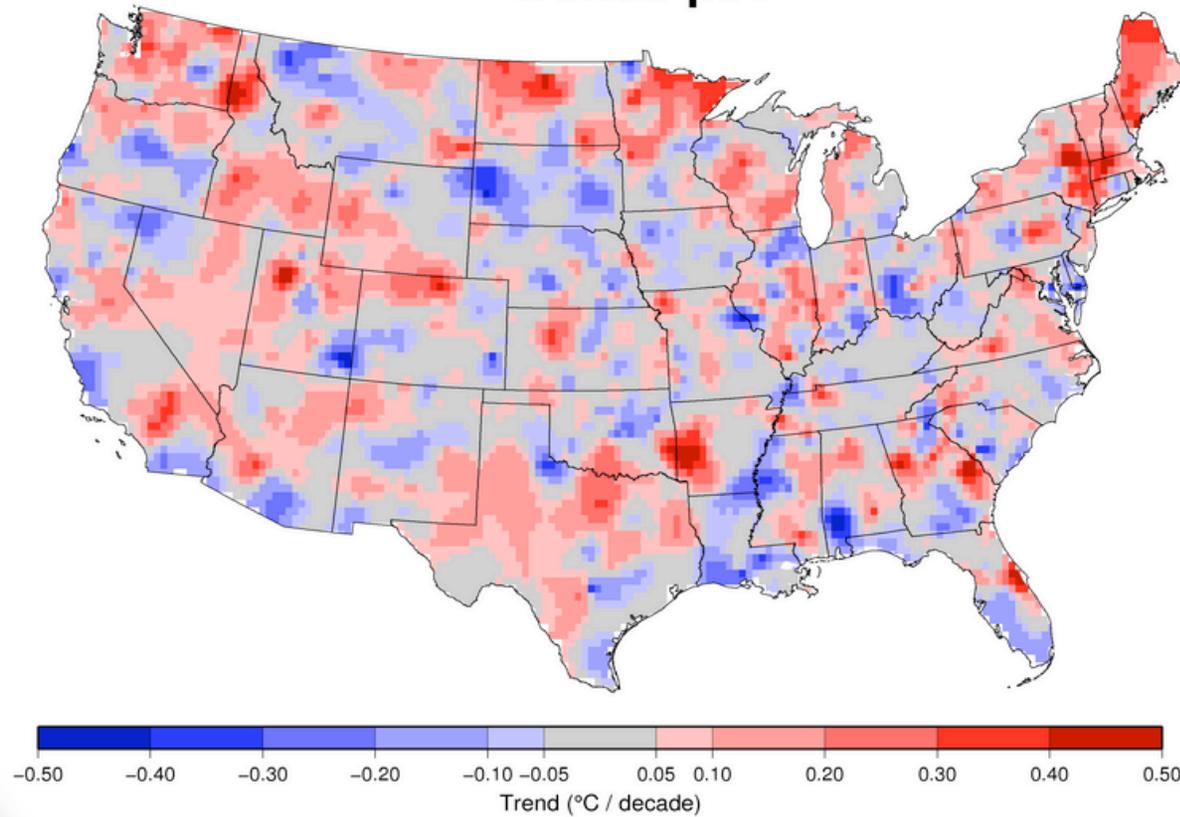
Benchmarking example

- For USHCN (lower 48 states)
- 100 member perturbed ensemble of the NCDC pairwise algorithm was run on 8 analogs (Williams et al., submitted)
- Consideration solely of timeseries and trends
- Analyses that follow are for the hardest analog with frequent predominantly small breaks added



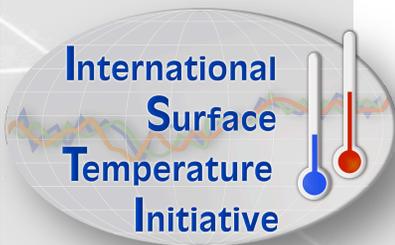
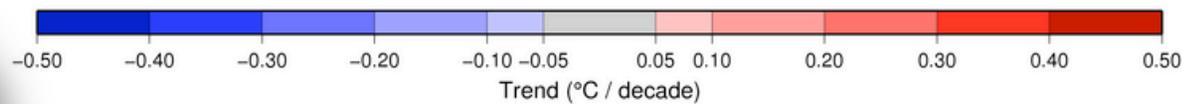
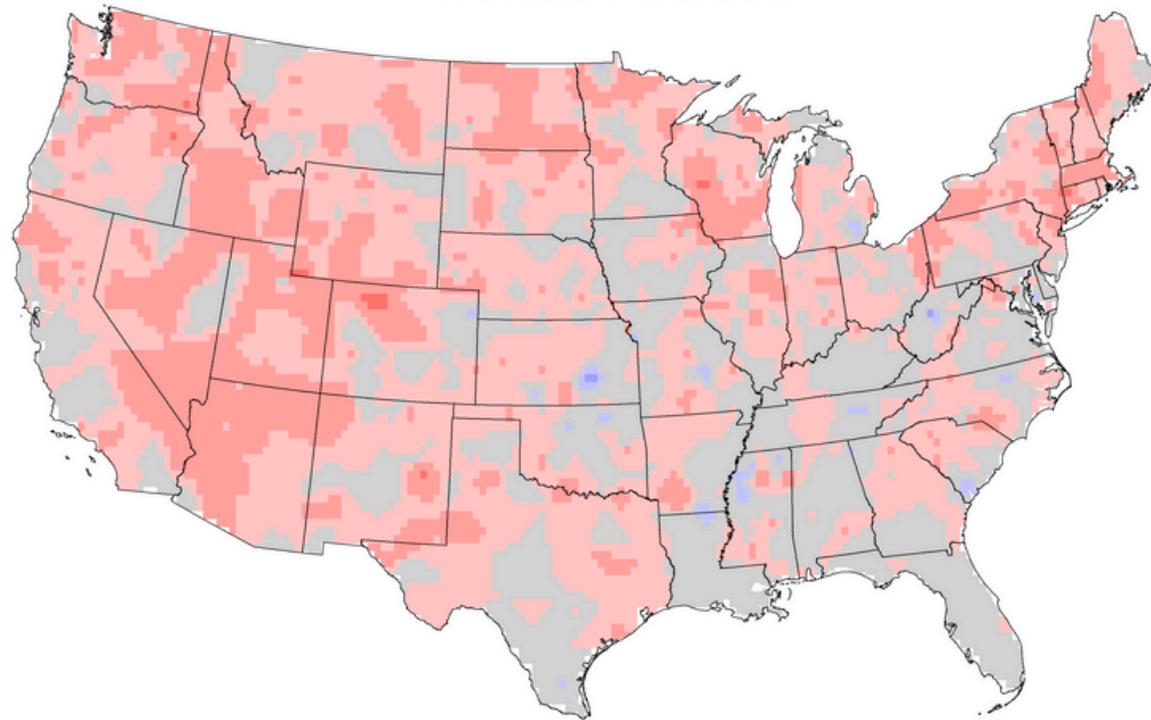
Synthetic data with added nastiness

world6 p01



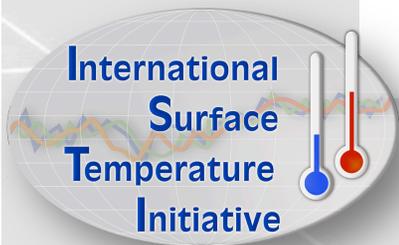
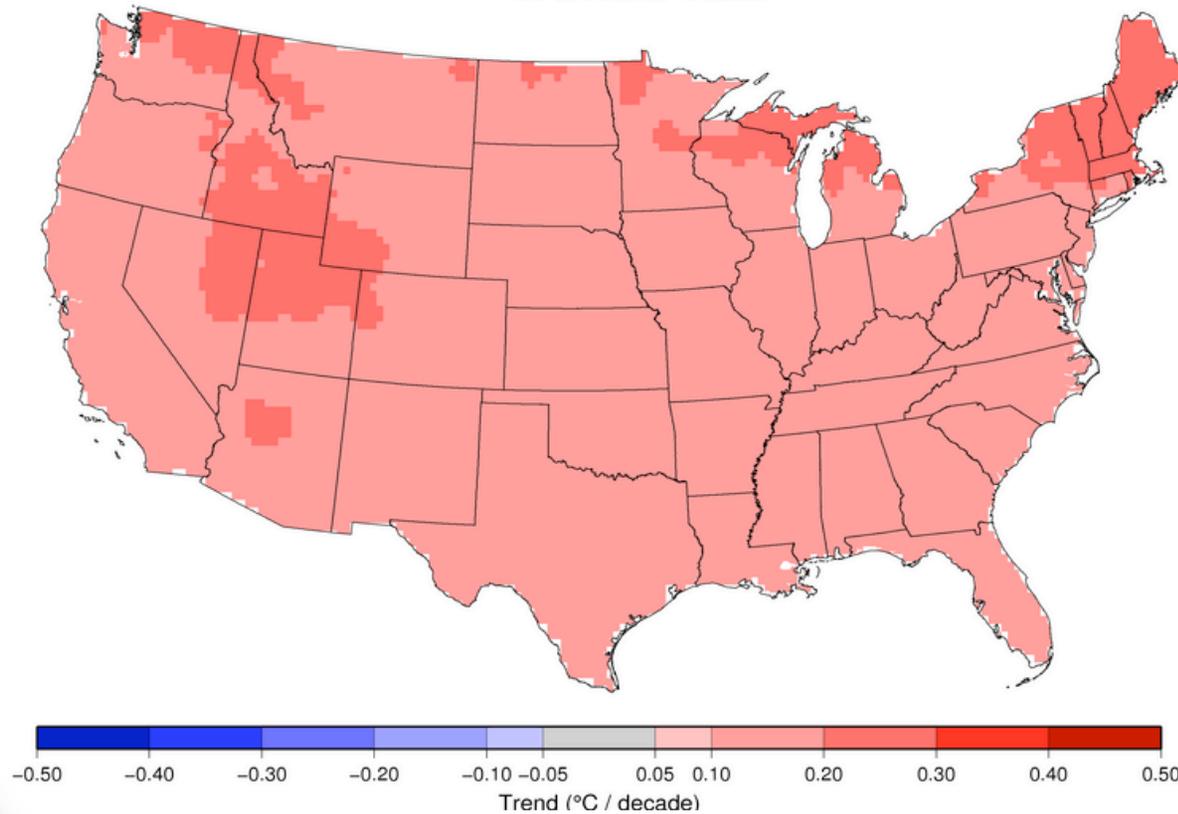
Operational algorithm estimate

world6 FLs.c00



Synthetic data without nastiness

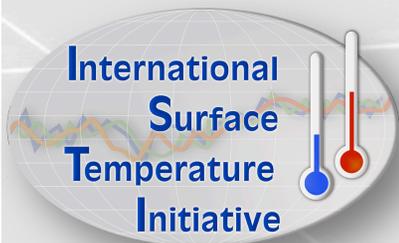
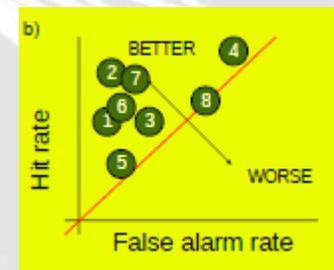
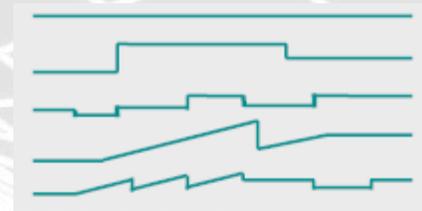
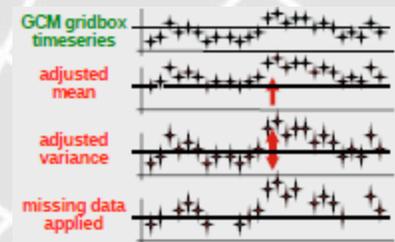
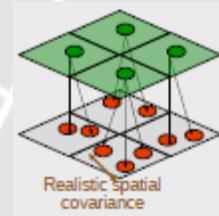
world6 raw



Implication when applied to real-world observed record that current dataset underestimates rate of historical warming within the United States, particularly for Tmax.

Benchmarking progress

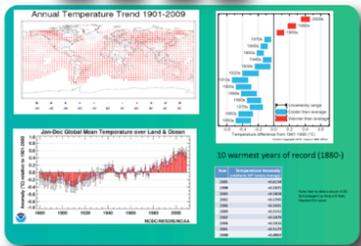
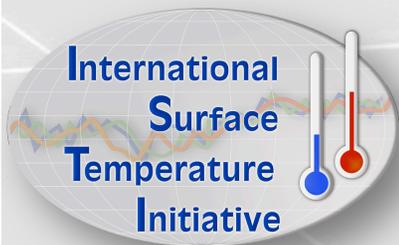
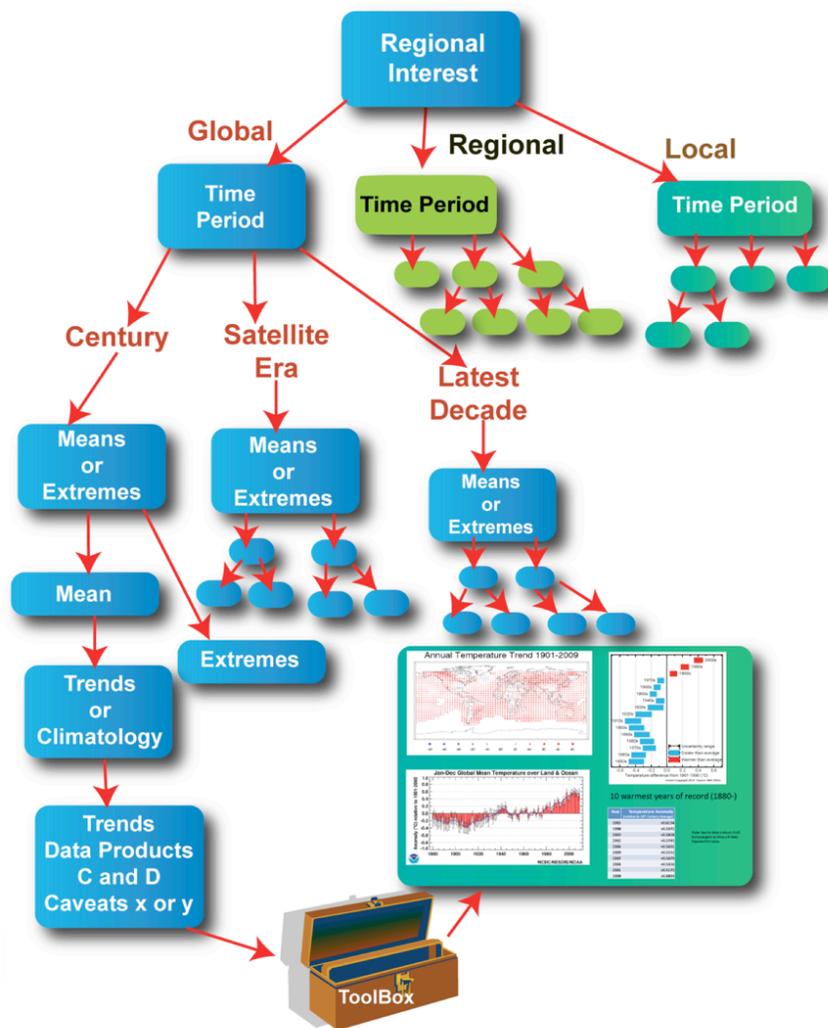
- Working group and task teams instigated
- Create c.10 analog-error-worlds
 - Climate model basis (maintains plausible far field correlation structure) tweaked with real station climate characteristics
 - Add random and systematic errors to approximate real world error structures which may exist
 - Algorithm assessment based upon ability to recover original data
 - Error structures should enable answering a range of questions / assumptions regarding the true error to avoid over-tuning



**Analogs to be made available
November 2012 based upon
version 1 release of databank**

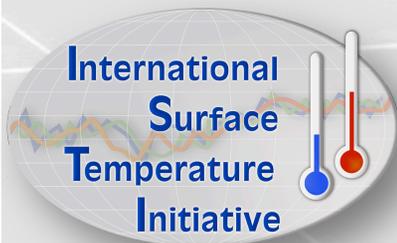
Serving products and aiding users

Hypothetical Decision Tree



You can help make this a success

- Help to find raw data sources
- Come up with novel ways of analyzing the data
- Use the databank to create data-products
- Partake in the benchmarking exercise
- Help to make a data product portal a reality
- Provide constructive feedback





Questions and Answers

www.surface temperatures.org

Bull. Amer. Met. Soc. doi: 10.1175/2011BAMS3124.1

General.enquiries@surface temperatures.org

Data.submission@surface temperatures.org