



# ESA Climate Change Initiative Phase-II

## Sea Surface Temperature (SST)

[www.esa-sst-cci.org](http://www.esa-sst-cci.org)

### SST CCI legacy

Merchant, Rayner, Corlett, Mittaz, Roquet

# Pre-CCI landscape for SST CDR

- Europe
  - operational satellite SST collaboration catalysed by OSI-SAF
  - MyOcean re-analysis dependent on biased US Pathfinder AVHRR
  - satellite products not explicitly geared to work with century-scale products
  - good interactions with ATSR Reprocessing for Climate on R&D, straddling historic and operational experts somewhat
- Internationally
  - well-organised via Group for High Resolution Sea Surface Temperature



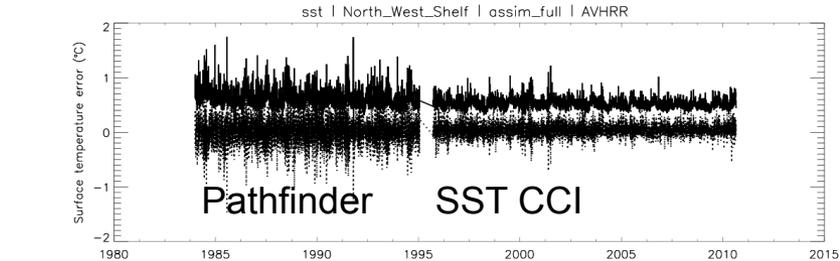
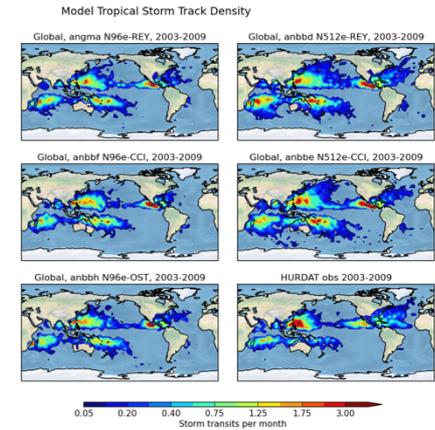
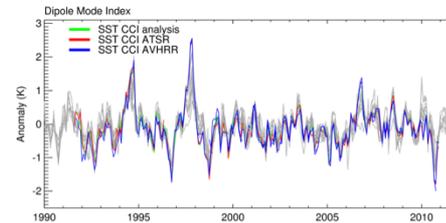
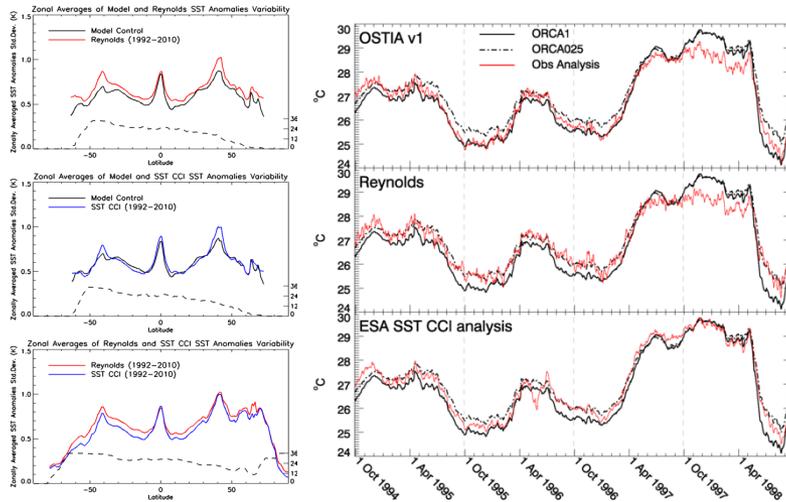
- international task sharing on operational SST, standards, etc
- slower progress w.r.t. climate data records, retrieval and uncertainty

# European landscape for SST now

- Integrated pan-European team for SST R&D
  - spanning operations and climate
  - infra-red and microwave
  - spanning L1 to L4
  - linking satellite and century-scale
- Most complete AVHRR GAC archive is in Europe
  - Improved AVHRR reprocessing based on physics, linked to ATSRs for calibration, less biased, with credible uncertainties
  - SST CCI v2 will push back into early 1980s → ~35 year satellite record
- Long-record + short-delay update will create big demand by users

# Legacy with SST users

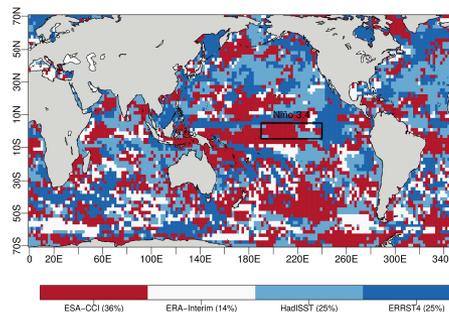
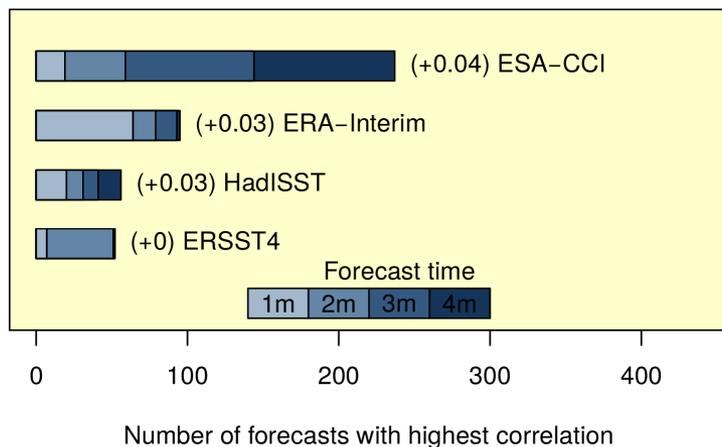
- Users much more engaged with issues of SST quality
  - Climate Assessment Reports



- Users seem much more engaged with uncertainty concepts
  - Contrast in user requirements surveys
  - SST CCI workshop on uncertainty for climate data records, 2014
- Satellite data are more confidently integrated with century-scale analyses
  - satellite-based assessments included as independent information in IPCC

# Legacy with SST users

- Users much more engaged with issues of SST quality in datasets
  - Climate Assessment Reports, **but also nice to see independent take-up**



From Bellprat presentation last year on importance of choice of SST data in model assessment

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# Impact on GHRSSST

- Leadership of Climate Data Records group over past 5 years
  - Merchant, and now Mittaz
  - Framework for assessment of SST CDRs, based on PVIR/CAR
    - Establishes methods for stability, sensitivity, uncertainty characterisation that are comparable across alternate CDRs
- SST CCI a trail blazer in improving SST products, including operations
  - Strong exchange of techniques with EUMETSAT Ocean and Sea Ice Satellite Applications Facility (OSI-SAF) & NOAA
  - Direct impact on operational (meteorological) products (transfer of ideas from climate to operations)
  - Advances in level-4 analysis in CCI also benefitting operational OSTIA SST
- Continue to make the case for the community to move forward to more rational basis for uncertainty and quality information
- SST CCI first combined US-Euro data project on SST CDR, spanning L2 to L4 products

# Lessons

- Embedded Climate Research Group
  - detailed interaction with trail-blazer users
  - provides exemplars to wider community of users
- End-to-end team
  - Focus on the long term and climate scales leads to a holistic approach
  - Consistent L2 → L3 → L4 is appreciated by users
- User engagement, generating a higher profile of satellite data amongst the climate community
  - SST CCI URD strong influence on GCOS implementation requirements
- Reprocessing, re-evaluation and improvement cycle
  - Requirements are very demanding and require iterative improvements
  - Software management critical to preserving legacy

# Interaction: in situ observing system

- Profile from CCI has increased our standing to influence in situ observing system
- As satellite SST uncertainty has reduced, our requirements on the in situ system have become more stringent
  - GHRSSST statements on drifting buoy resolution and uncertainty
  - ESA support for fiducial reference measurements
  - SST CCI inputs, e.g.
    - Data Buoy Co-operation Panel (Oct 2016)
    - Review of tropical Pacific observing system (Sep 2016)
    - Inputs to NOAA Climate Observing System Council (June 2016)
- Global Tropical Moored Buoy Array crucial to proving long-term stability achieved in CDR
  - Temporary erosion of coverage, and questions as to long-term design
- New uses of Argo profiles (supported by CCN)

# Interaction: C3S, H2020 and national efforts

- Mechanism for ongoing extension of SST CCI products as a short delay **Interim CDR (ICDR)** (expected C3S project)



- due March 2017
- To be brokered via C3S

- April 2017 - Sep 2018+
- Continue v2 processor

- Reprocess CDR/ICDR
- upgrades from user request
- new R&D, ensure quality
- new Copernicus sensors
- Not within C3S scope

- **FIDUCEO ensemble SST CDR** from AVHRRs will also be brokered and is a possible input for v3
- The operations vs. research split offers a significant challenge of phasing round the improvement cycle
  - Widely recognised – no formula, but goodwill in ESA, EU and national parties

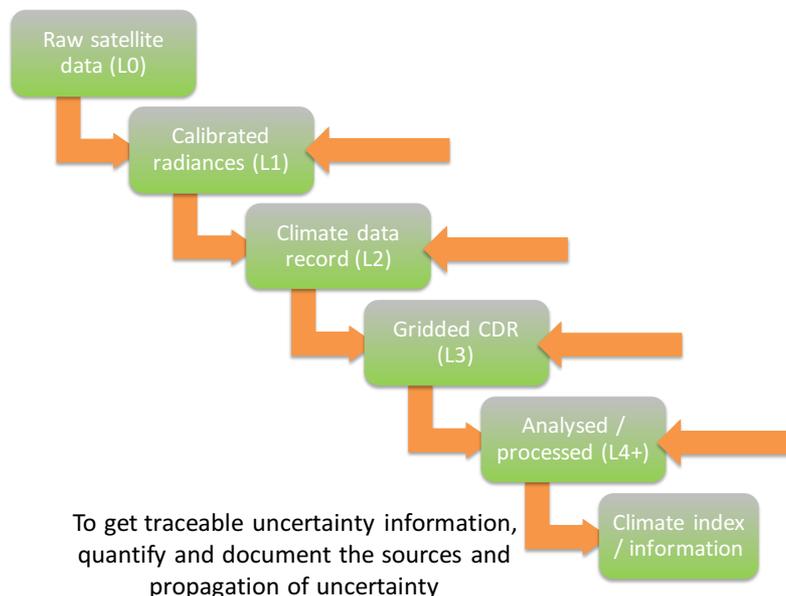
# Uncertainty/Harmonisation at L1

- Scientific legacy of SST CCI is 3-component uncertainty model at L2 / L3
  - SST CCI, GlobTemperature, EUSTACE
- But limitations of starting at L2 for uncertainty / harmonisation are clear
- FIDUCEO project targets L1 uncertainty and its propagation to CDRs

- Consider lessons for CCI+**

- Are there key L1 datasets for which proper uncertainty and harmonisation should be developed?

- Cross-ECV application



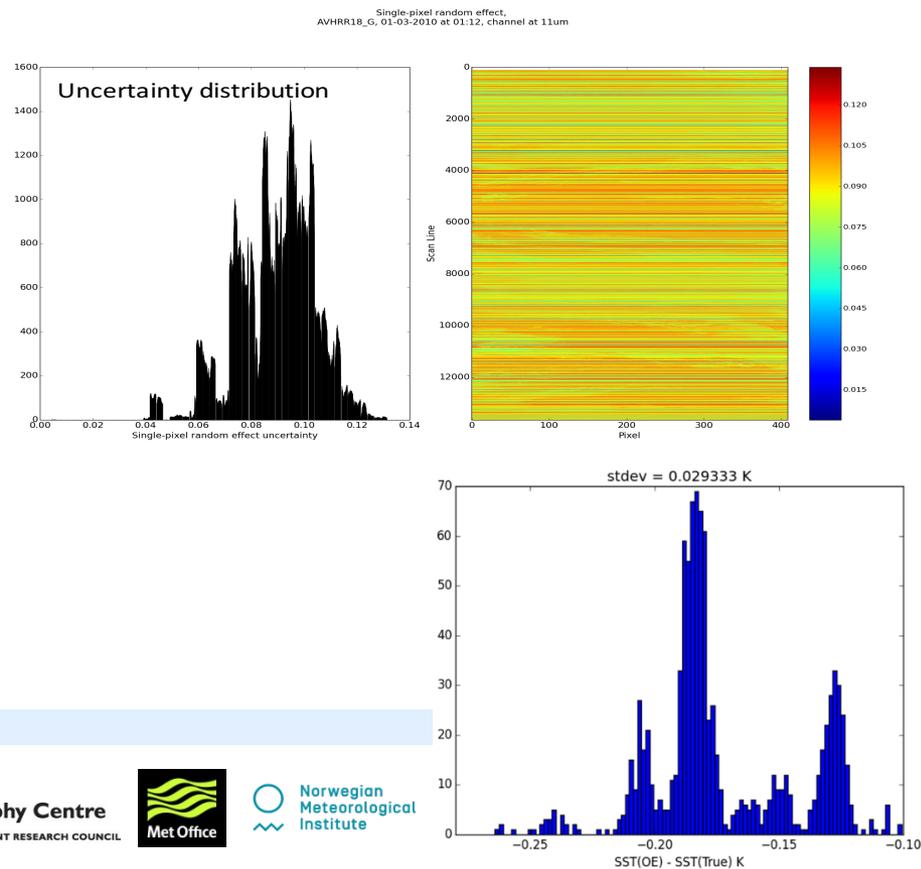
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# International cooperation on reprocessing

- SST CCI assembled the most complete set of the US AVHRR GAC data



- But in the SLSTR / VIIRS era, moving data across the Atlantic is not so smart
- **Can international co-operation in reprocessing be organised?**
- E.g., can we run CCI processor on VIIRS at NASA, in exchange for equivalent capacity for NASA to process SLSTR / OLCI?