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Evaluation of the AIRS skin and air surface Temperatures

AIRS Fall Meeting, Greenbelt, MA 2015

Intention and Data

Look at spatial patterns and variability of the diurnal cycle and difference between skin and air-surface temperatures using

AIRS v6, L3: 1 x 1 deg² grid, monthly.

Prelude On Climatology: Story of Two Ha's

Global is a mean of locals



Jim Hansen
["Can We Defuse the Global Warming
Time Bomb?"](#) (2003)

Global is an ensemble average of local random weather changes

Klaus Hasselmann



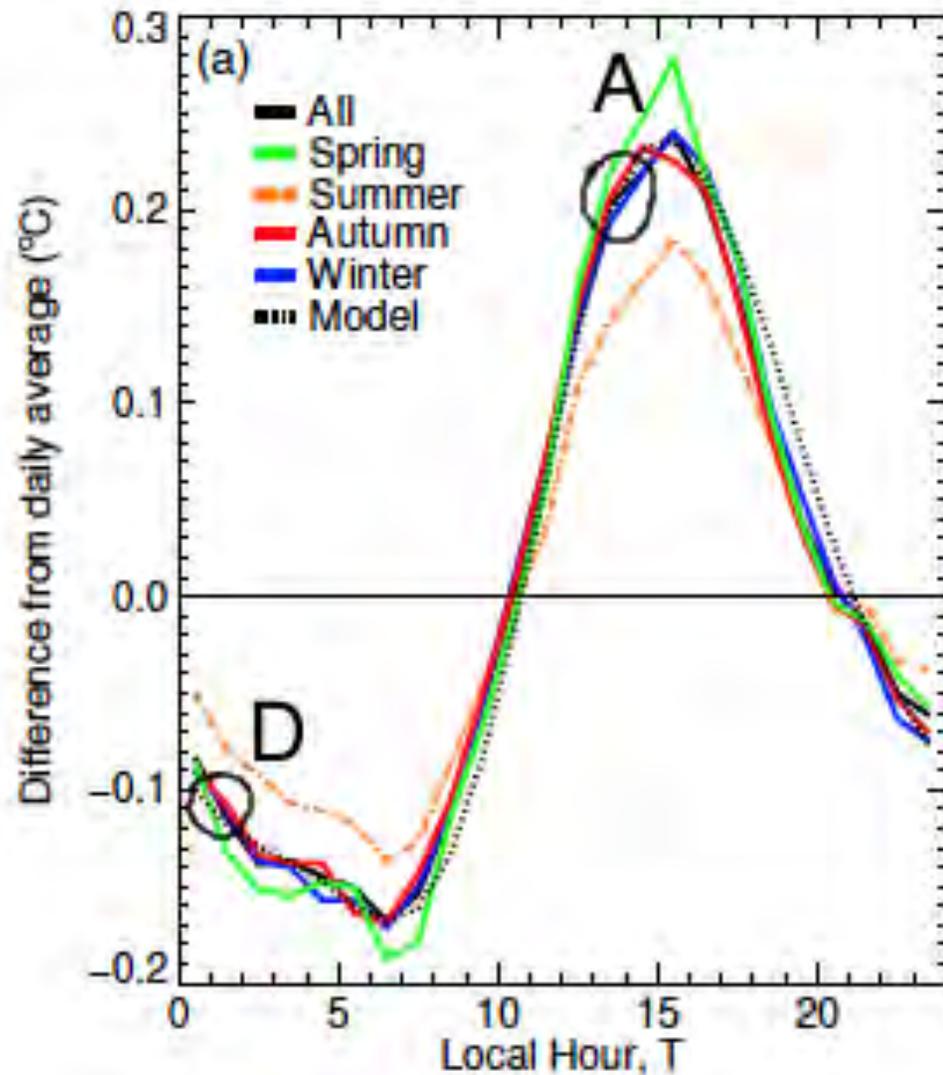
MAX-PLANCK-GESELLSCHAFT



Climatology as an ensemble of climate patterns

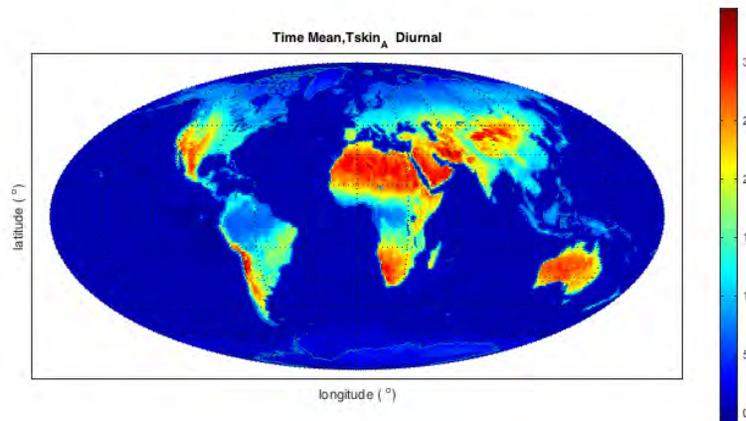
Climate change is variability of climate indices associated with the patterns

Diurnal Cycle



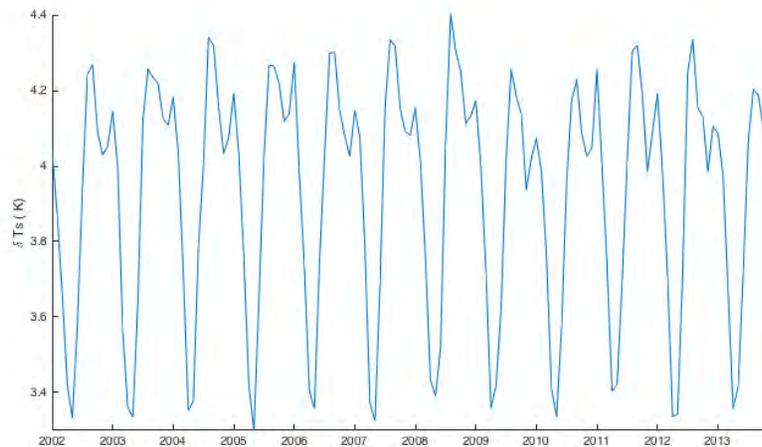
AIRS ascending – descending difference as a measure of the diurnal cycle

Diurnal Cycle, Global View



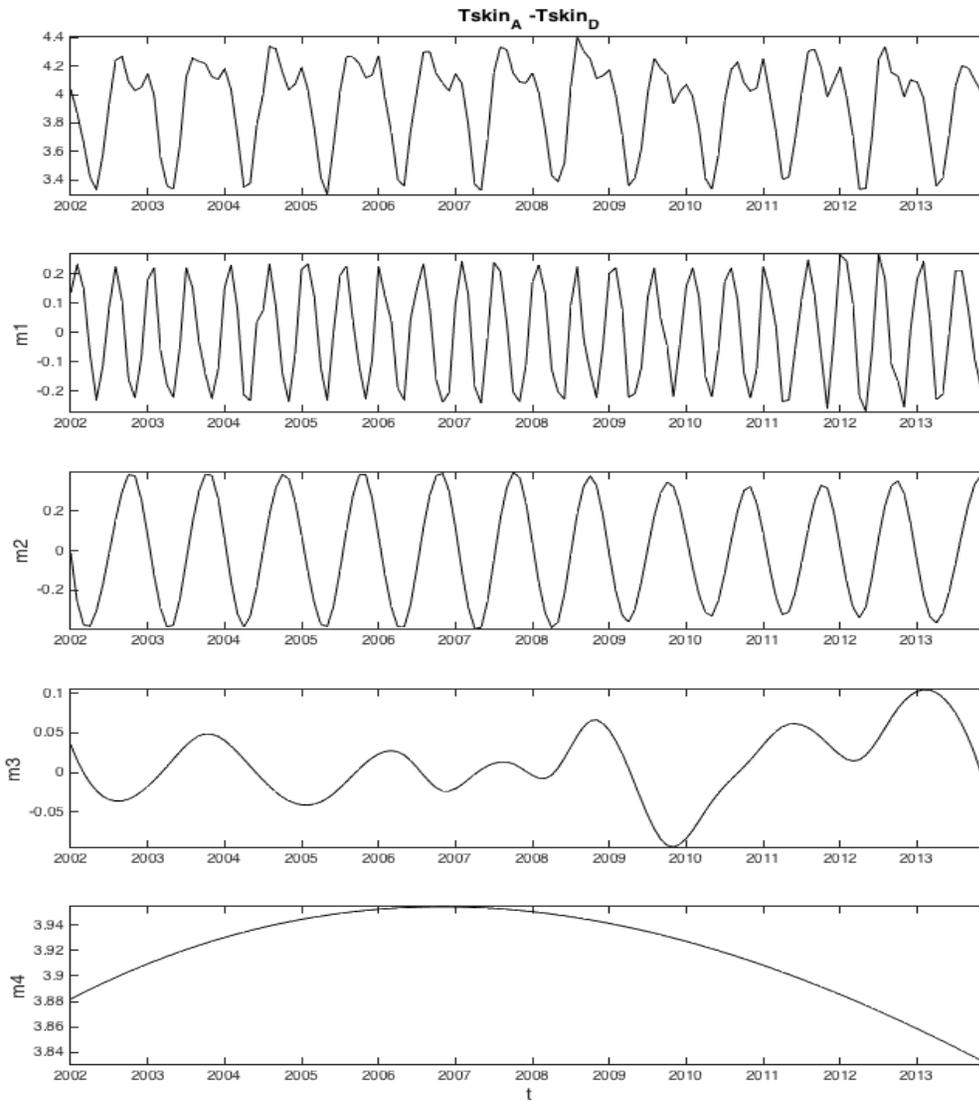
T_{skin_A}
12yr time mean over 2002-2014

Weak DC over ocean
Strong DC over land



Time variability of global DC

Spectral Content of Global DC



Data

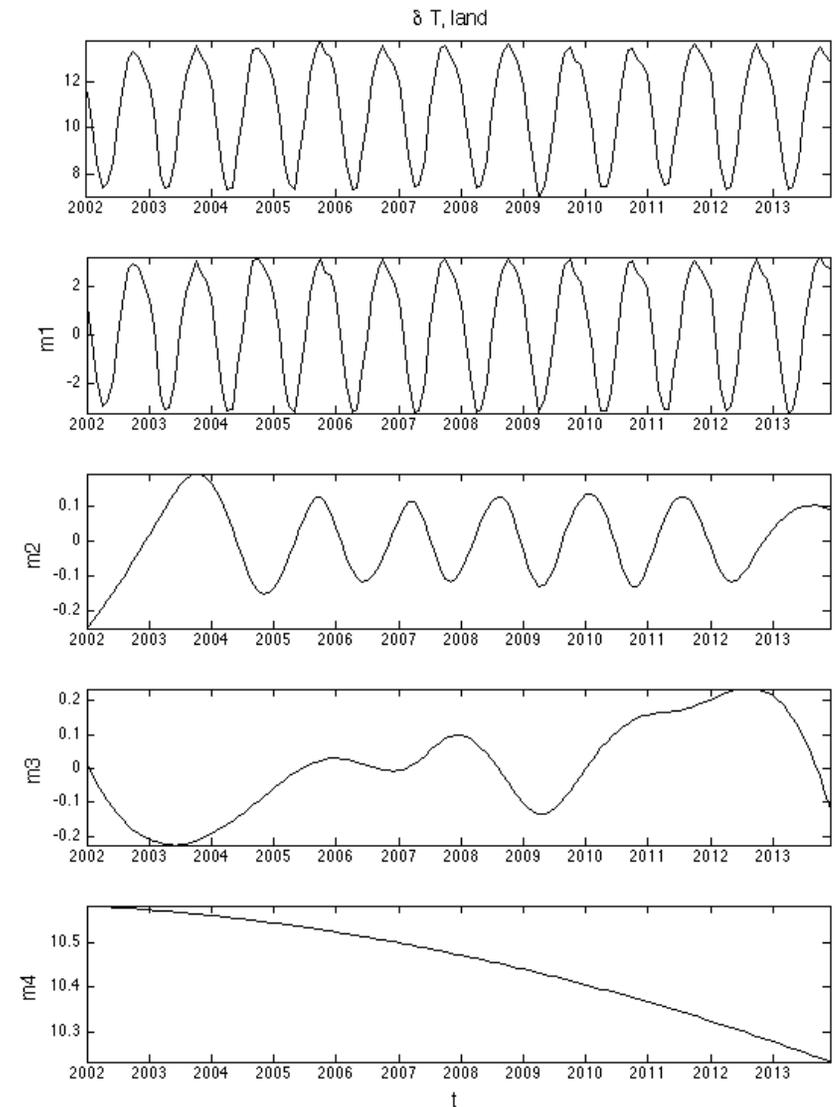
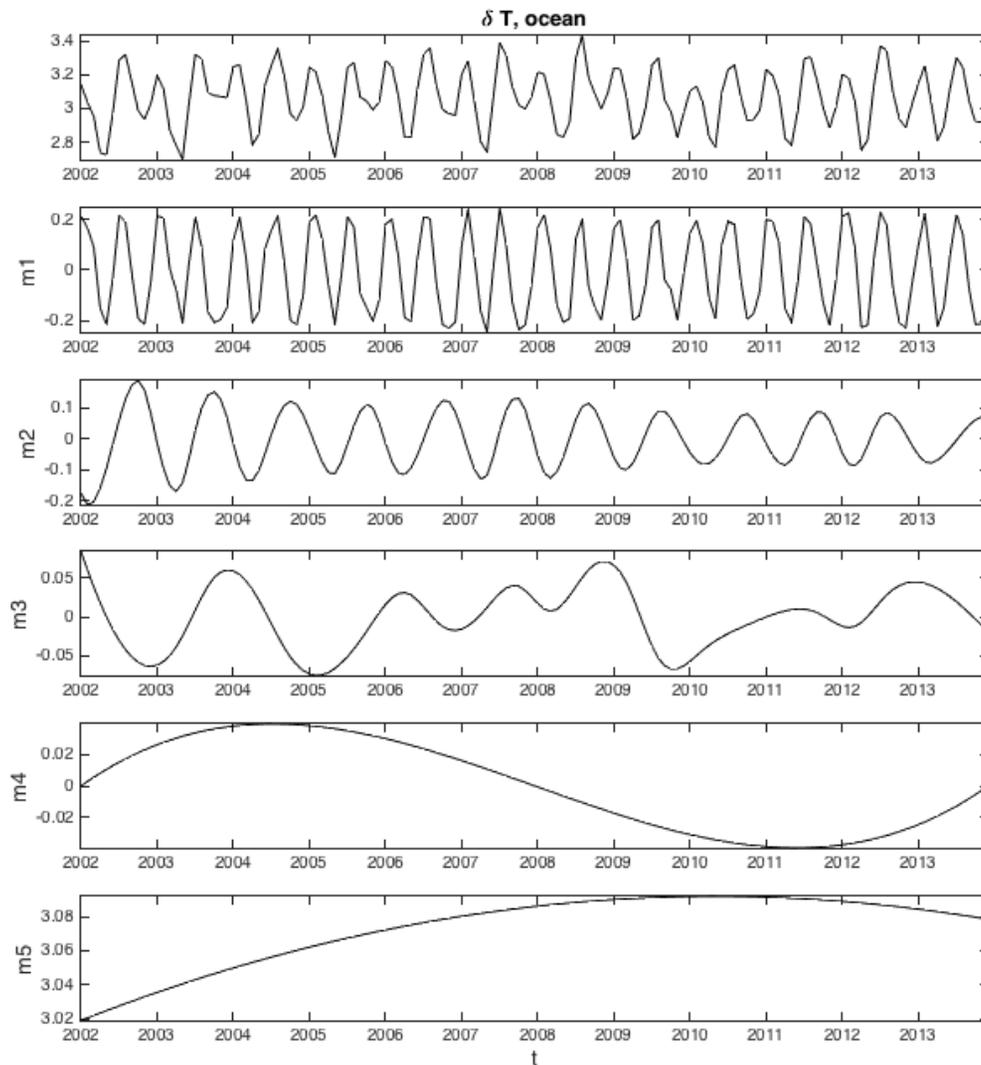
Semi-annual

Annual

Interannual

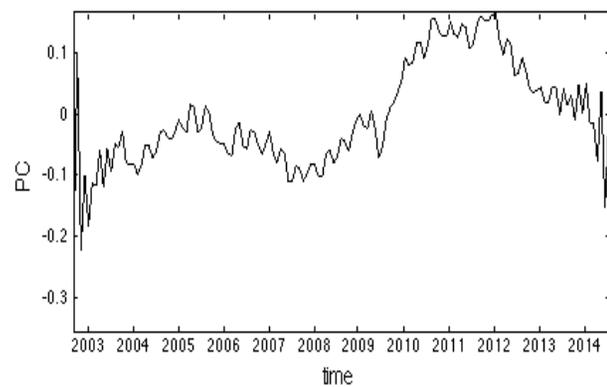
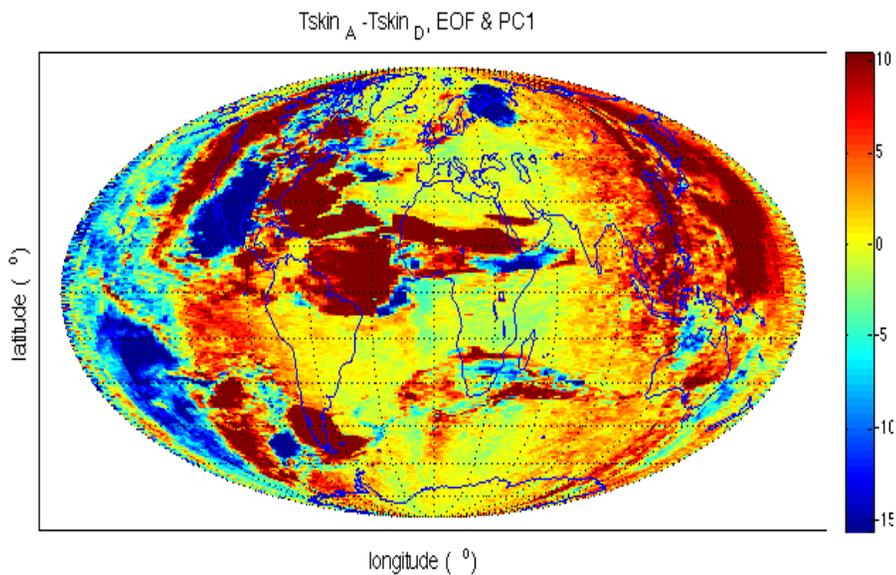
Nonlinear trend

DC Variability over ocean and land

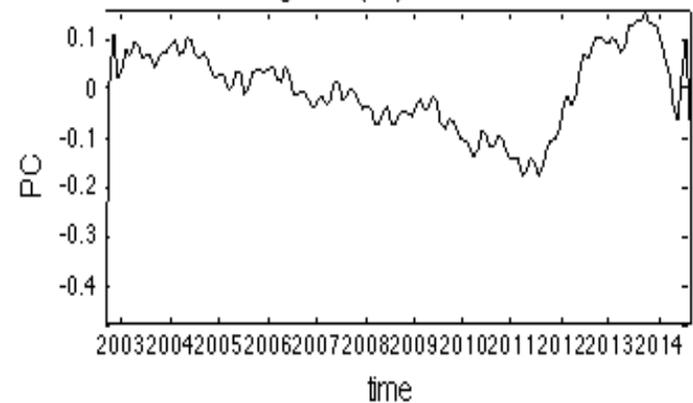
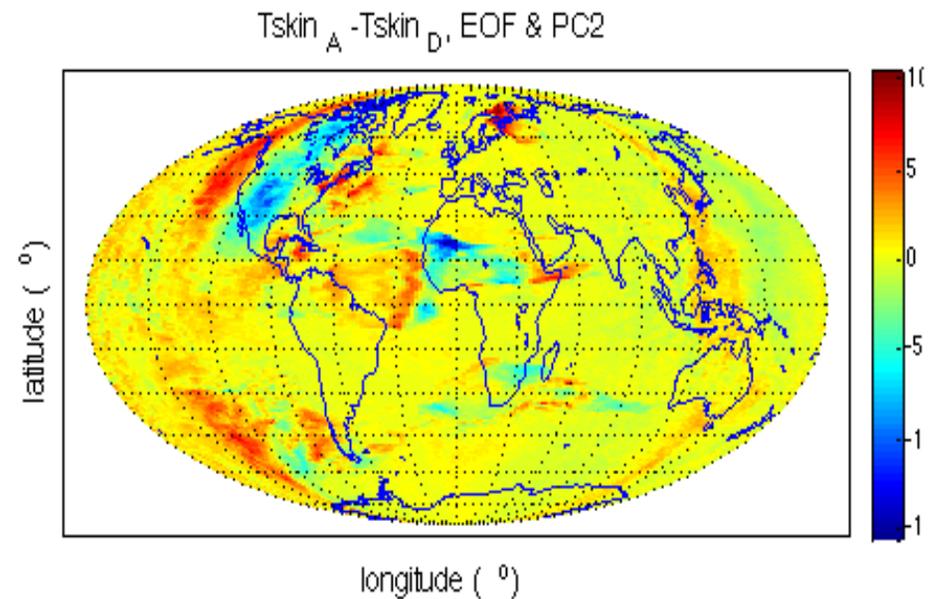


DC EOF Variability Patterns

EOF & PC1, 67%



EOF & PC2, 24%

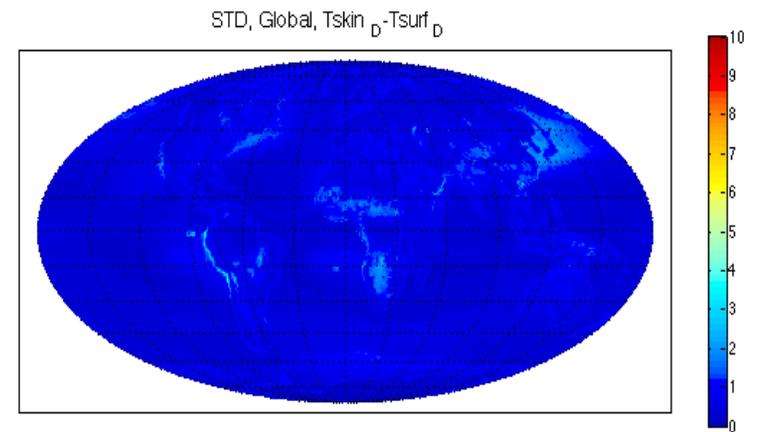
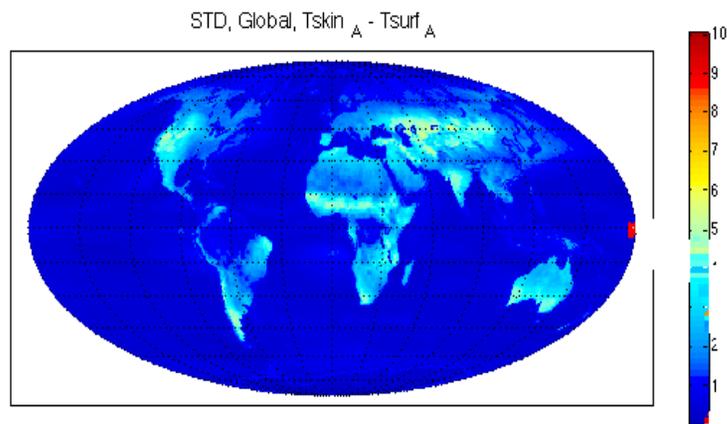
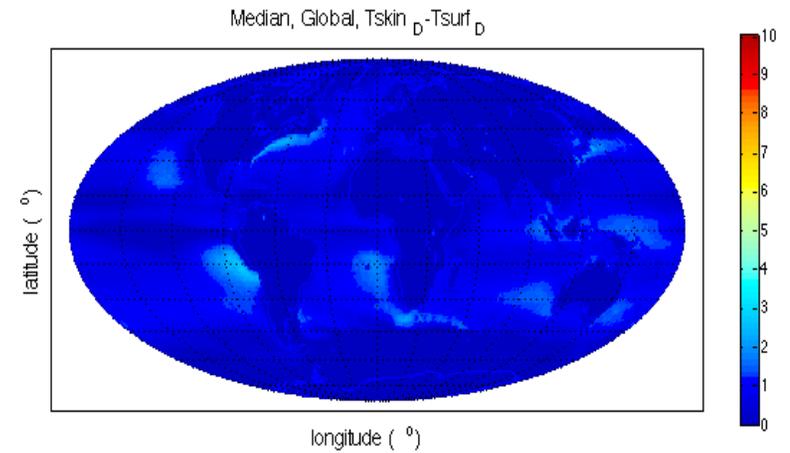
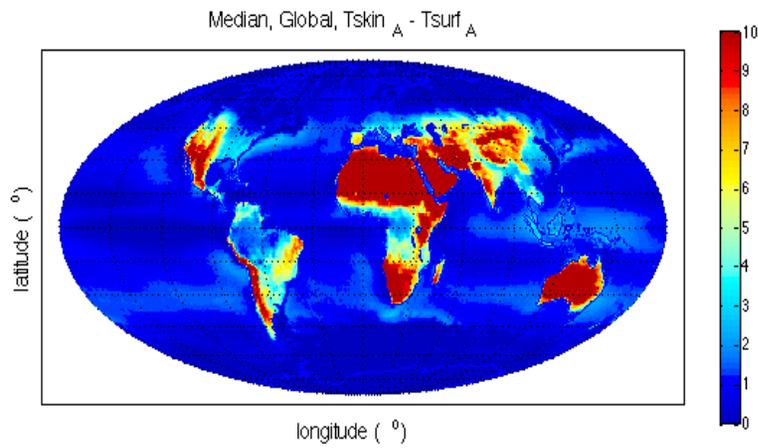


Tskin & Tairsurf Difference

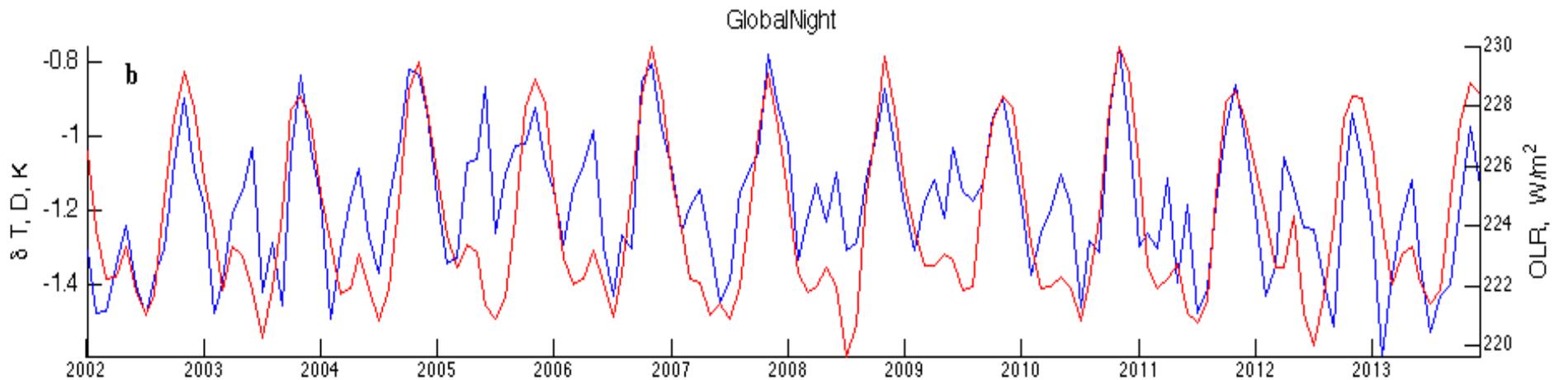
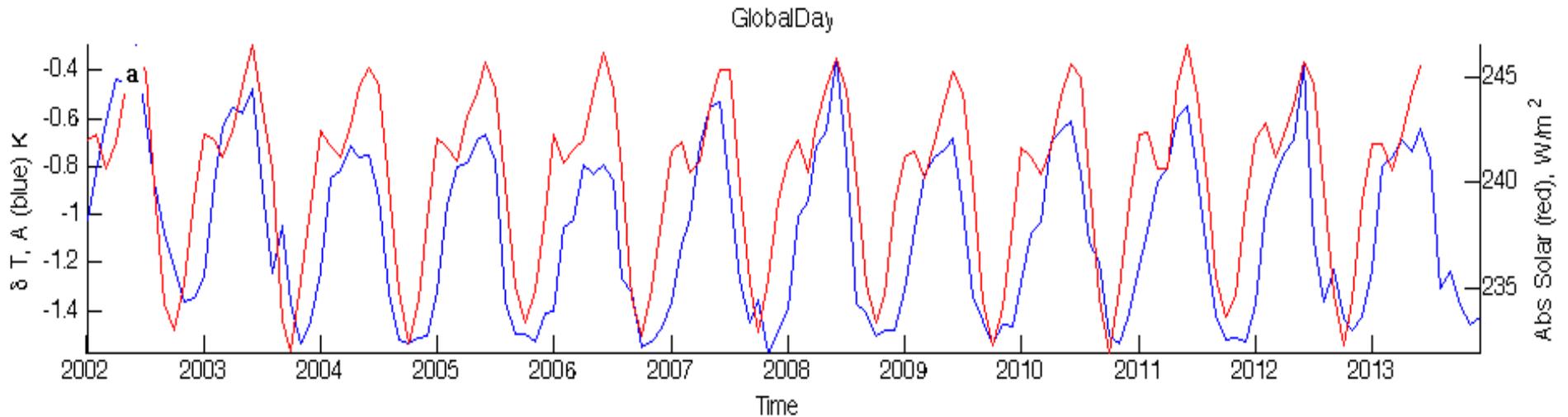
$$\delta T = T_{\text{skin}} - T_{\text{airsurf}}$$

Day

Night



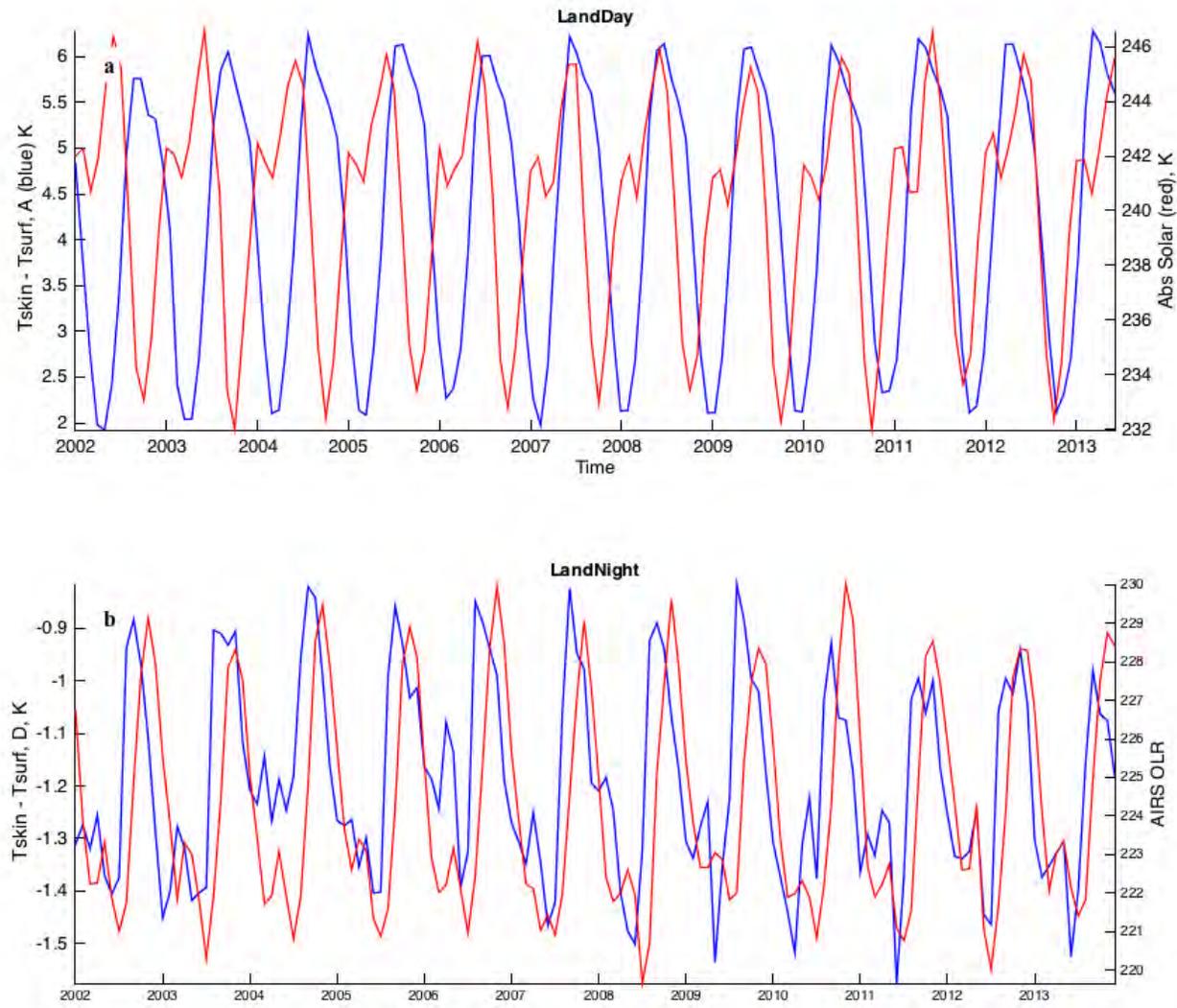
$\delta T = T_{\text{skin}} - T_{\text{airsurf}}$: Solar & OLR



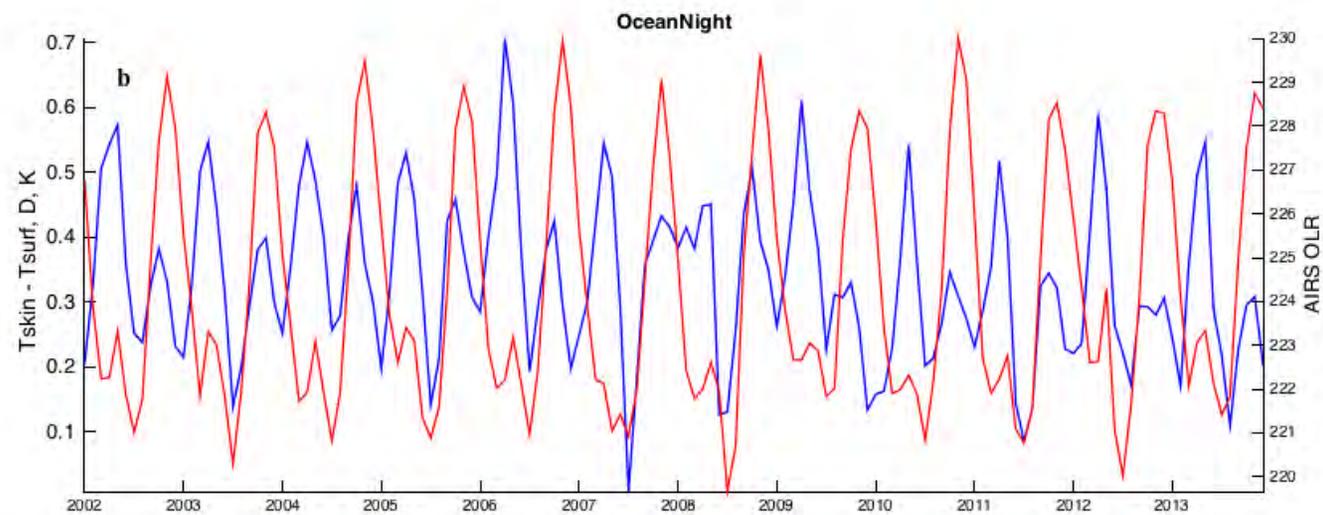
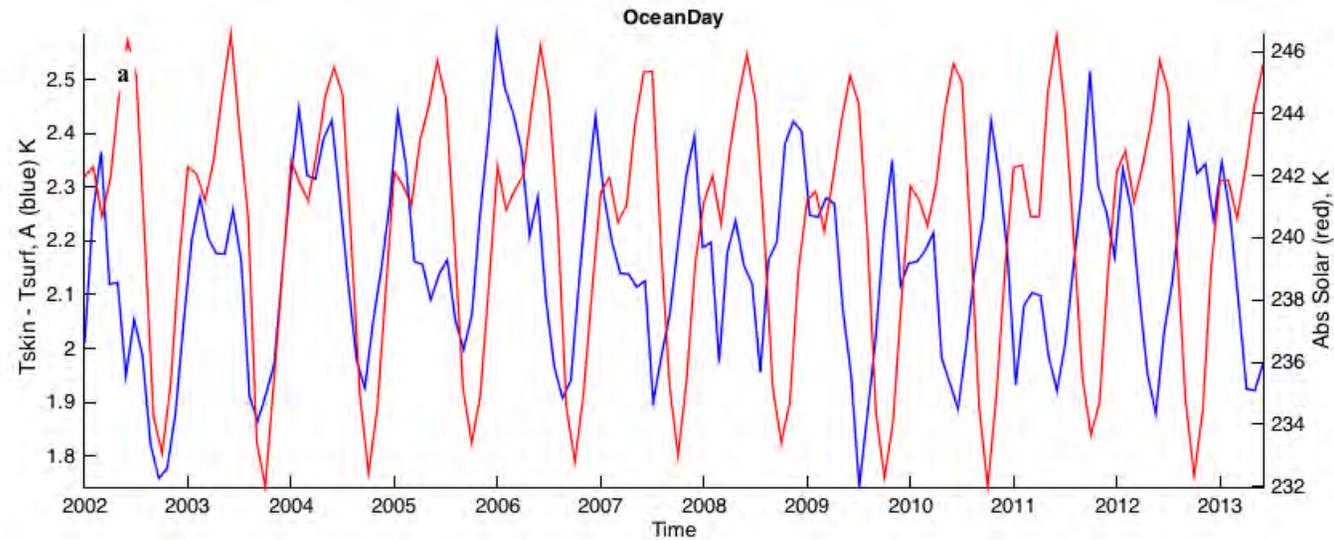
δT day correlates with absorbed SW

δT night correlates with OLR

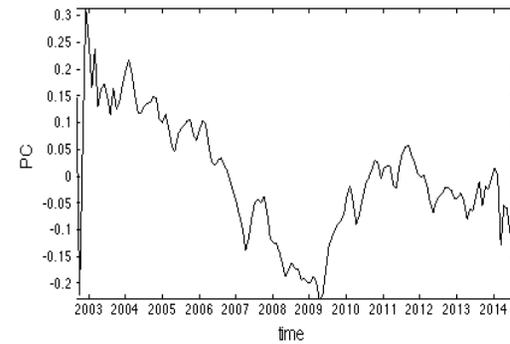
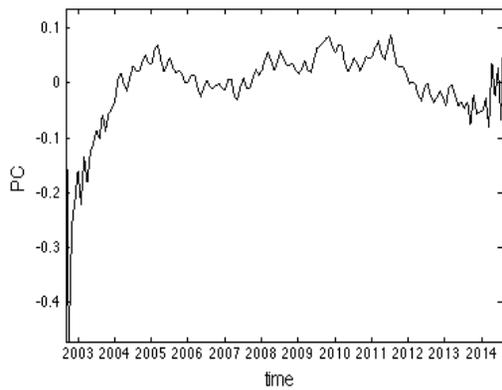
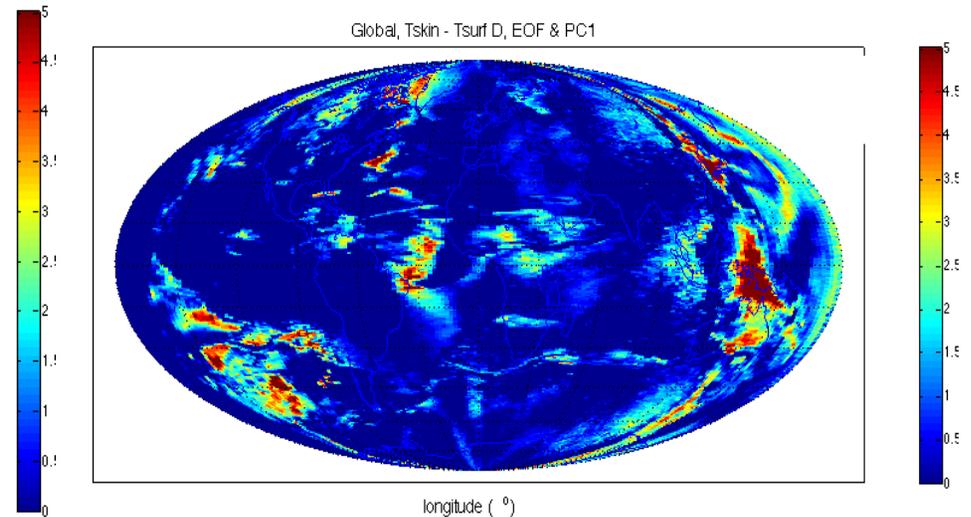
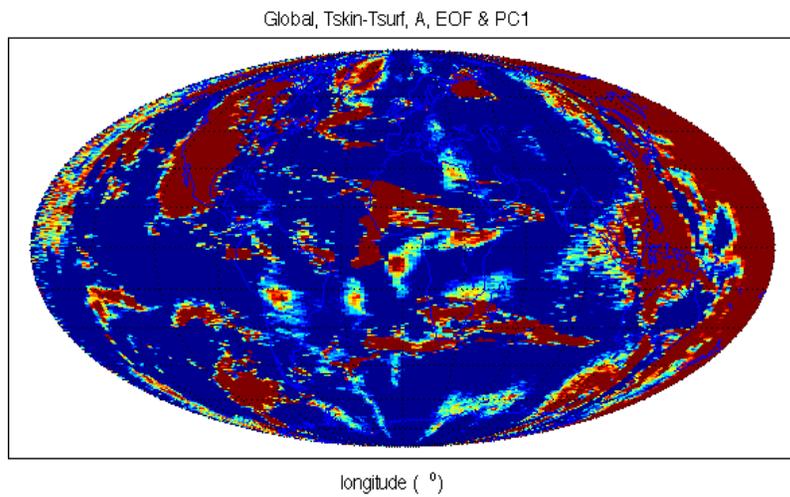
T surf – Tskin: Land (60S-60N)



T surf – Tskin: Ocean (60S-60N)



δT EOF & PC 1



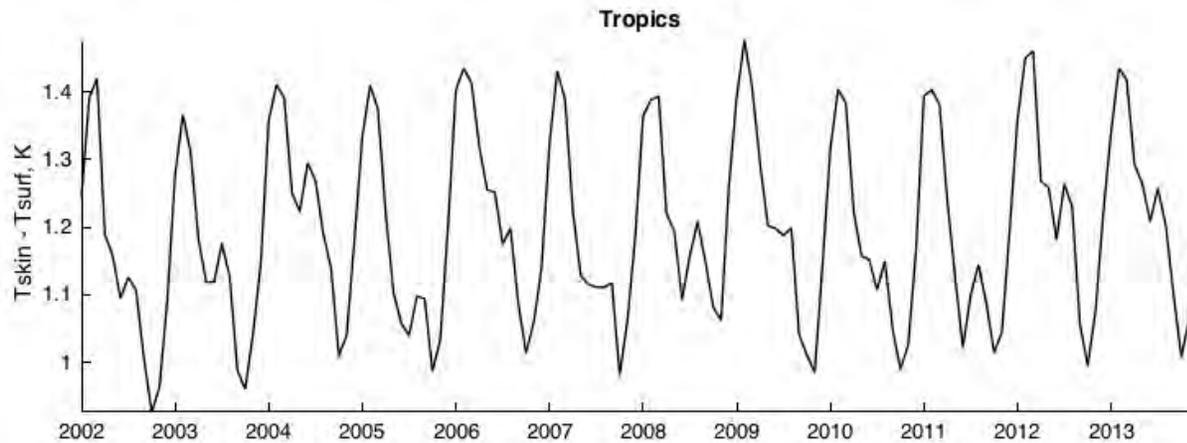
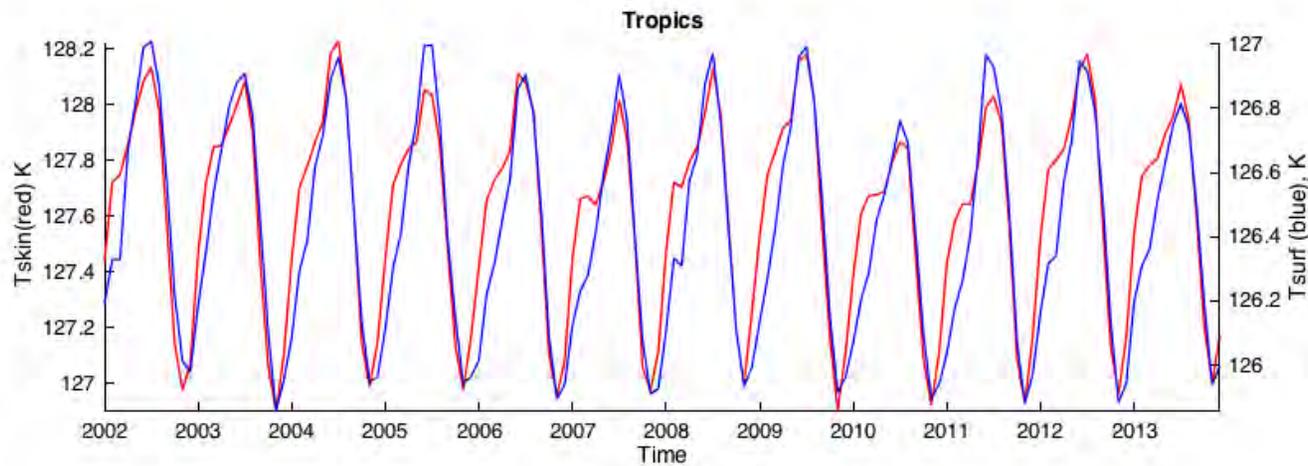
Day, 71% variability

Night, 40% variability

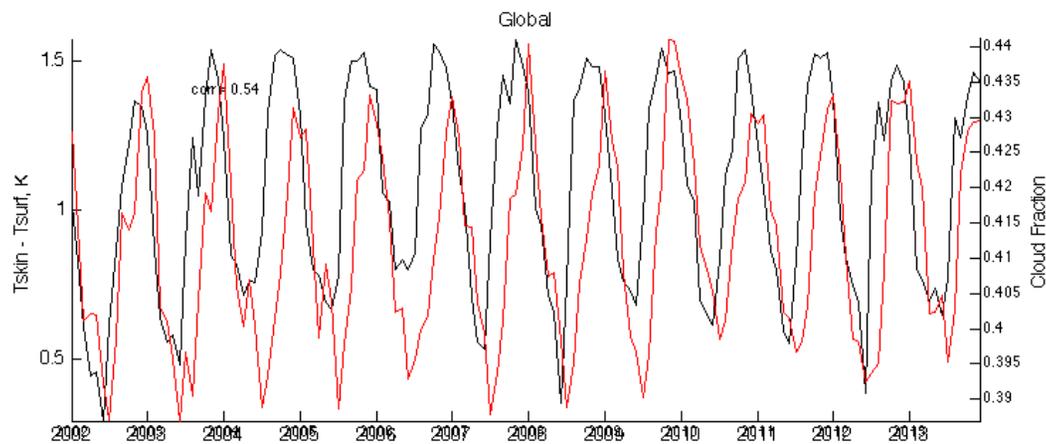
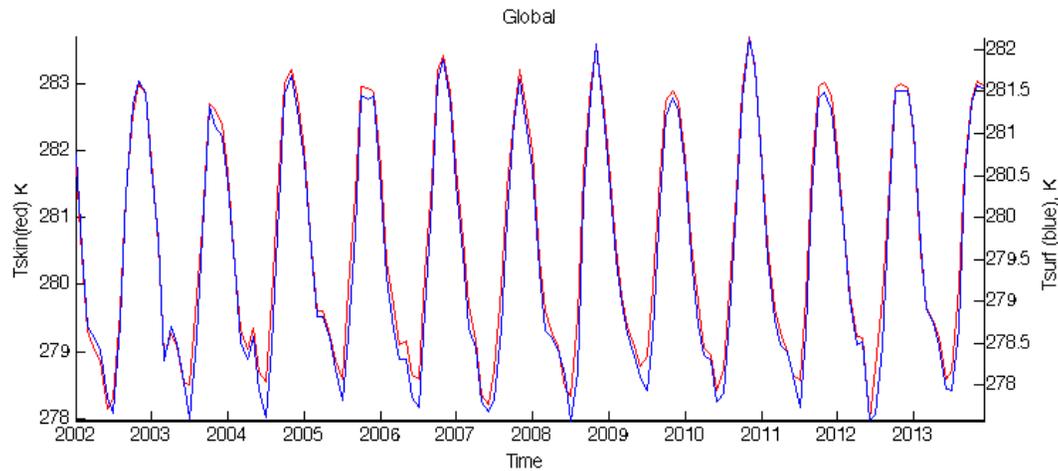
Inferences

- ✧ AIRS Tskin provides a measure of spatial-time variability of Diurnal Cycle
- ✧ DC is warming over ocean and cooling over land (decadal trends)
- ✧ $T_{surf} - T_{skin}$ A (day) correlates with absorbed SW and cloud fraction
- ✧ $T_{skin} - T_{surf}$ D (night) correlates with OLR

T surf - Tskin Tropics (-30-30°)

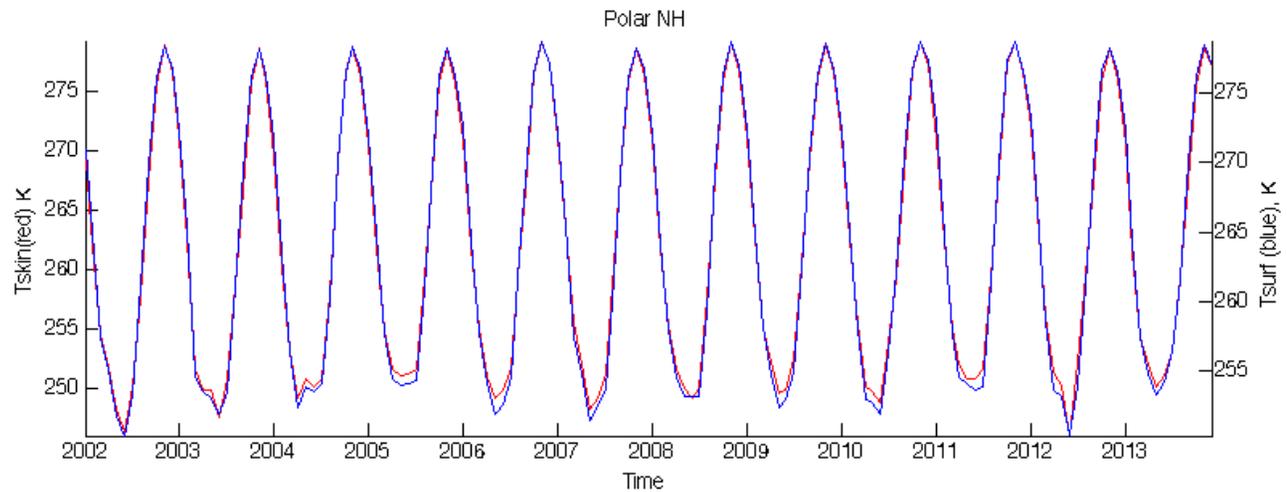


$\delta T = T_{\text{skin}} - T_{\text{air surf}}$: and Cloud Fraction



δT correlates with
Cloud fraction

T surf - Tskin NH Polar (70-90°)



corr = 0.58

