Application and Evaluation of Diurnal Warming Models Forced with GFS Model Inputs

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Motivation

- Preparation for real-time computation of diurnal warming estimates
- Facilitate further comparison and validation of models

Components

- Model Inputs
  - GFS analysis fields, 6 hourly, 0.5 degree
    - Wind stress
    - Radiative and turbulent fluxes
  - Wave Watch III Wave Model
    - Wave period, direction, and significant wave height
- Models currently implemented
  - Kantha Clayson
  - COARE
  - Parameterizations

Logistics

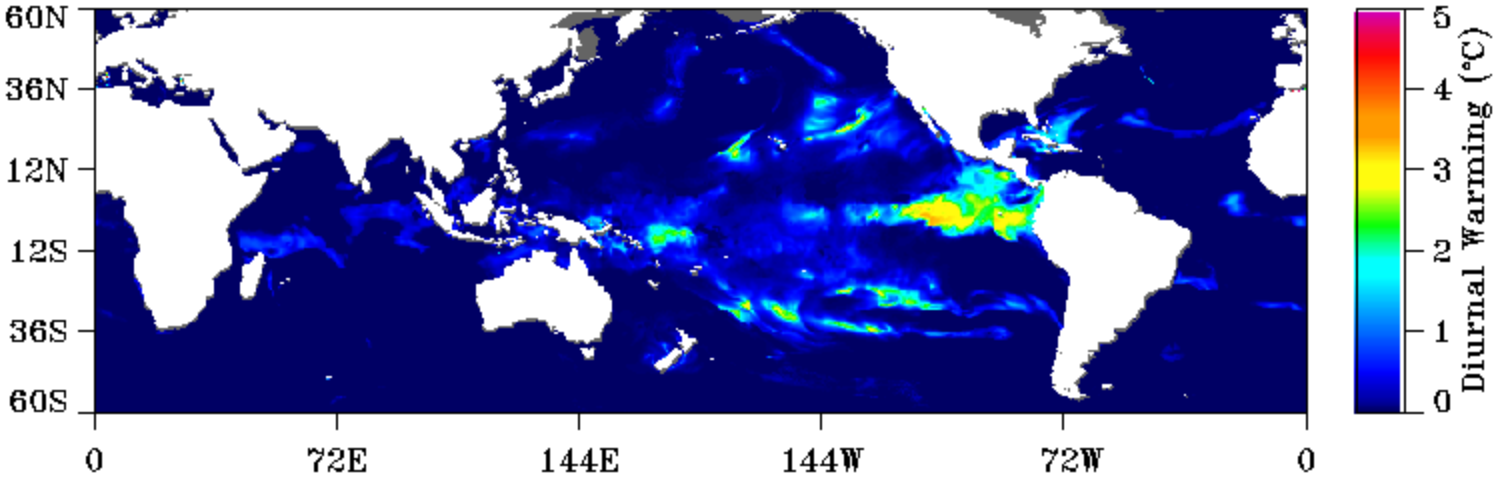
- Models initialized based on SST
- Fluxes interpolated to model time step
- Model run globally for 2 days with output taken from the second day
- Real-time implementation just being finalized

- Warming compared against SEVIRI observations

SAMPLE MODEL RESULTS

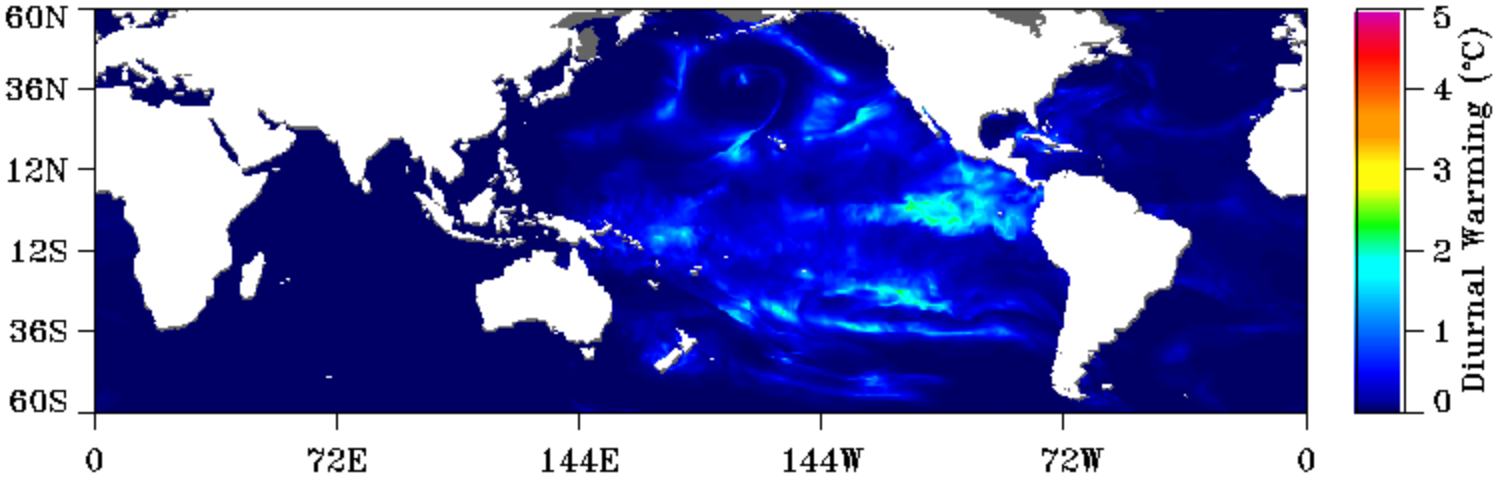
Kantha Clayson Stokes Drift Model

Diurnal Warming Evolution, 00-23 UTC, 21 March 2013



Gentemann Parameterization

Diurnal Warming Evolution, 00-23 UTC, 21 March 2013

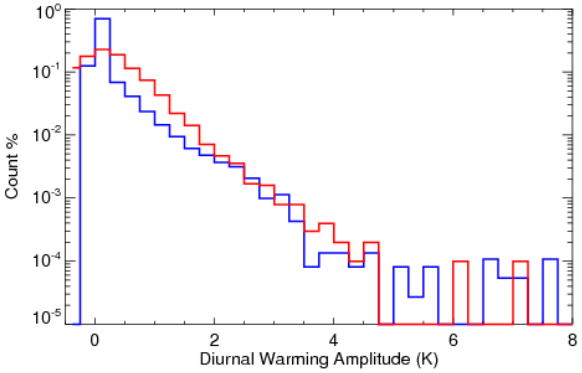


COMPARISON OF WARMING DISTRIBUTIONS WITH SEVIRI OBSERVATIONS

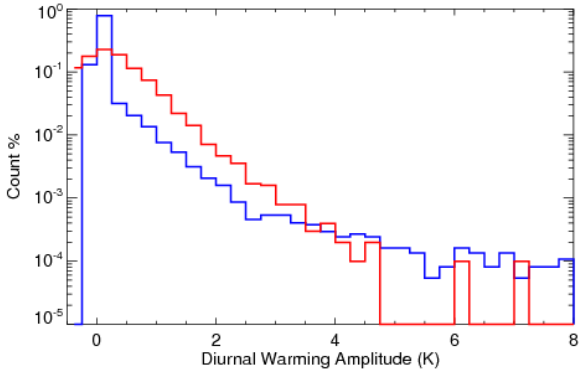
Comparison of Observed and Modeled Diurnal Warming

SEVIRI Domain – 21 March 2013, 1400 UTC

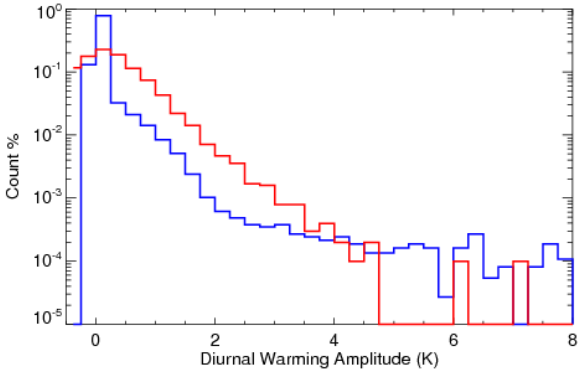
K-C Stokes Drift



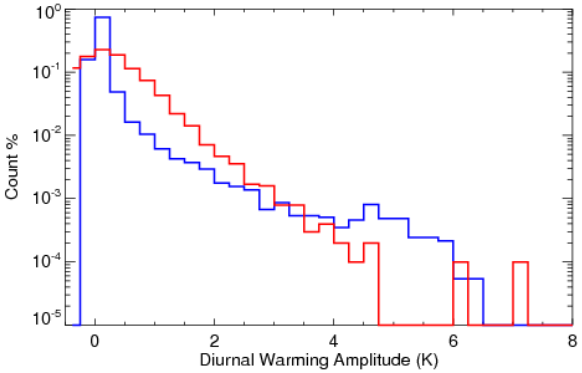
K-C Stokes Enh (2)



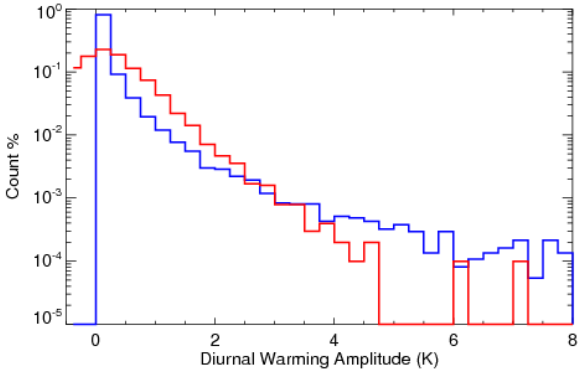
K-C Stokes Enhanced



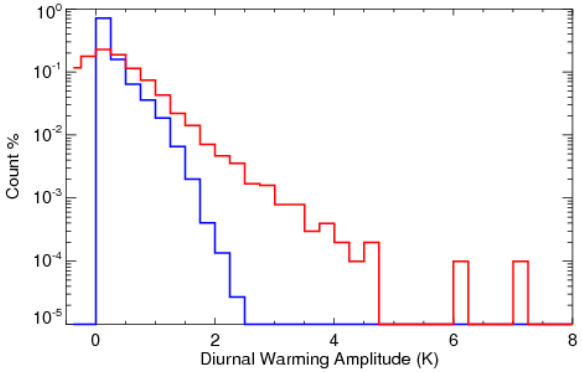
Wick K-C Blended



COARE



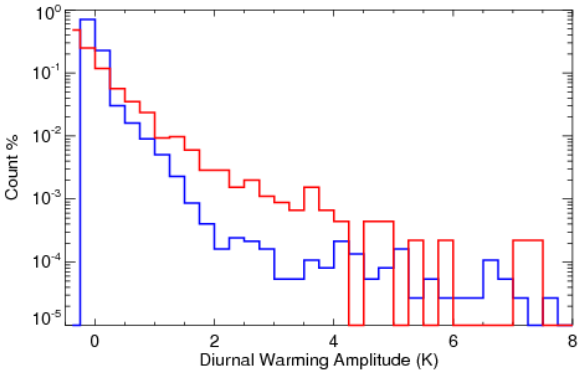
Gentemann



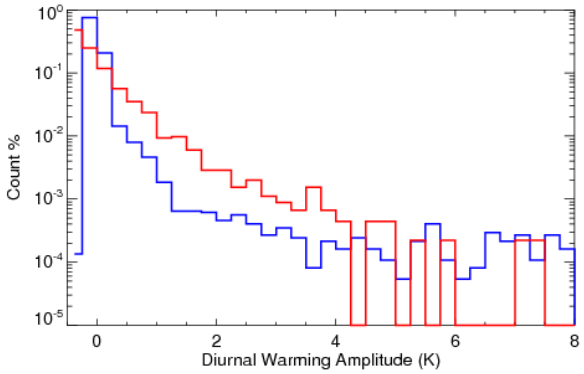
Comparison of Observed and Modeled Diurnal Warming

SEVIRI Domain – 21 March 2013, 2200 UTC

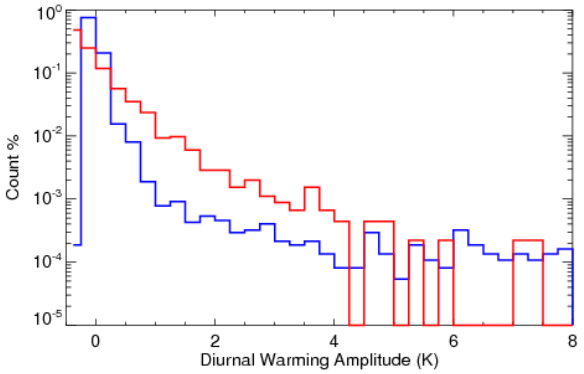
K-C Stokes Drift



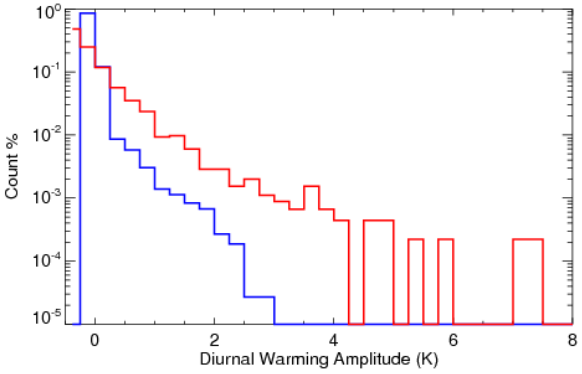
K-C Stokes Enh (2)



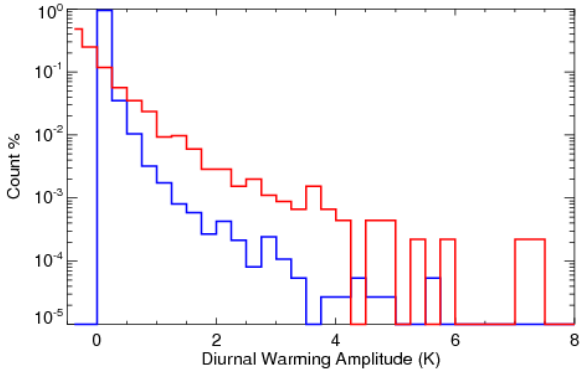
K-C Stokes Enhanced



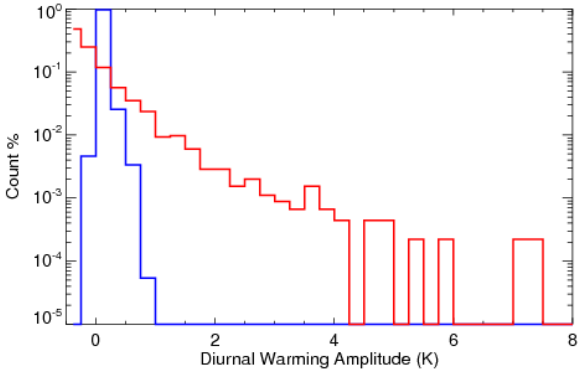
Wick K-C Blended



COARE



Gentemann



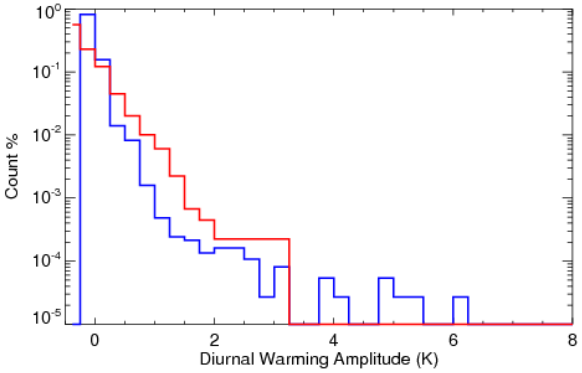
TIME EVOLUTION OF WARMING DISTRIBUTIONS FOR MODELS

Comparison of Observed and Modeled Diurnal Warming

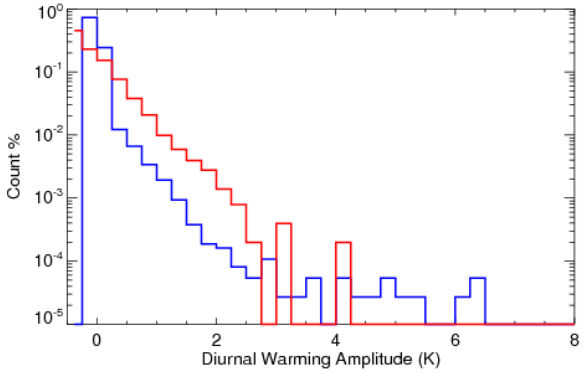
SEVIRI Domain – 21 March 2013

Kantha Clayson Model with Stokes Drift

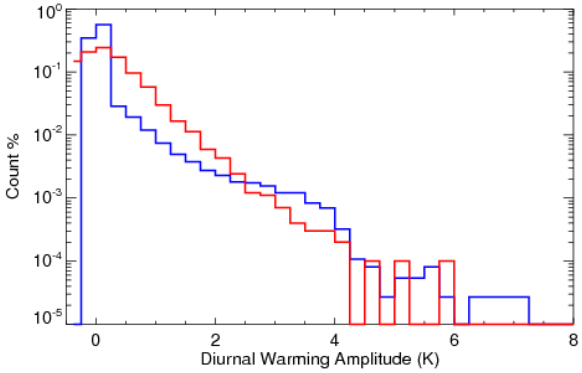
0200 UTC



0600 UTC



1000 UTC



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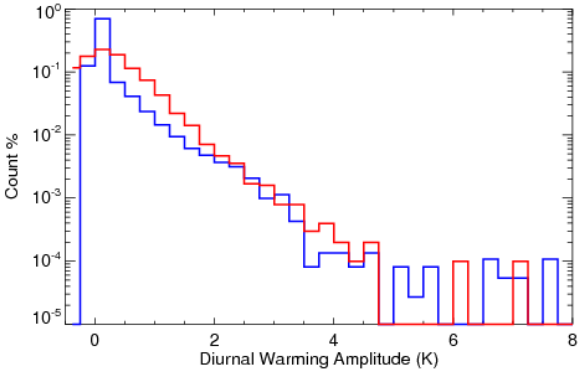
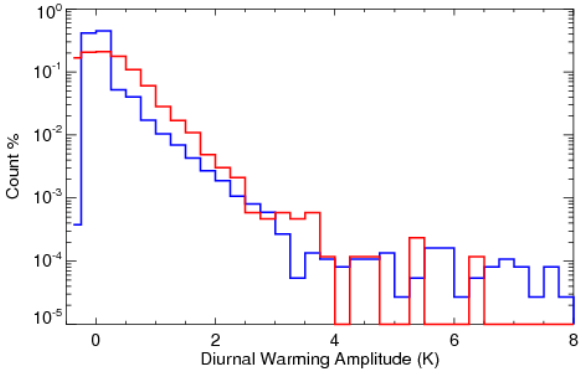


1800 UTC



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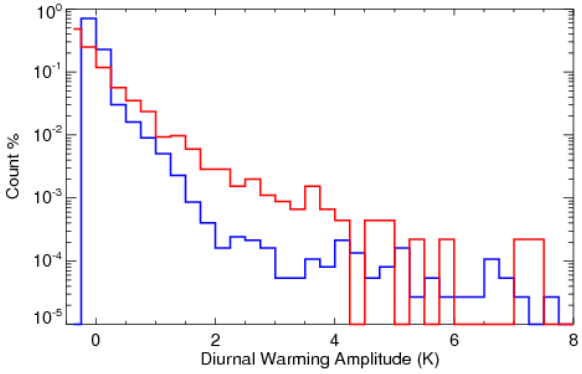
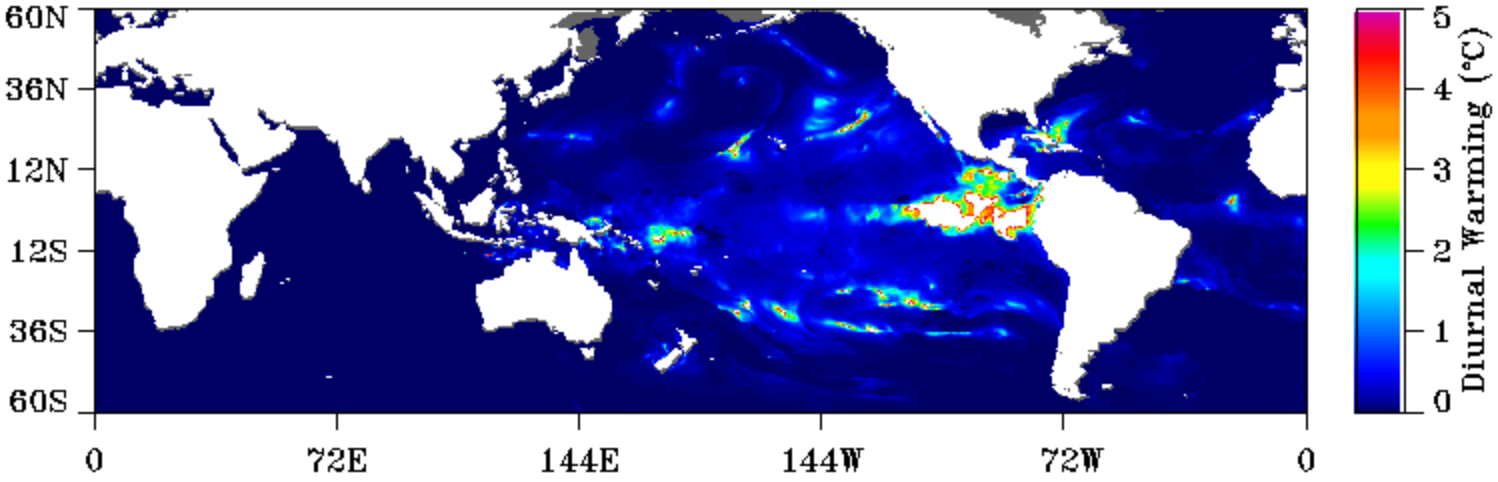


Summary

- Automated daily computation of global diurnal warming from NWP forcing coming on line
- Display, distribution, and evaluation of products to follow

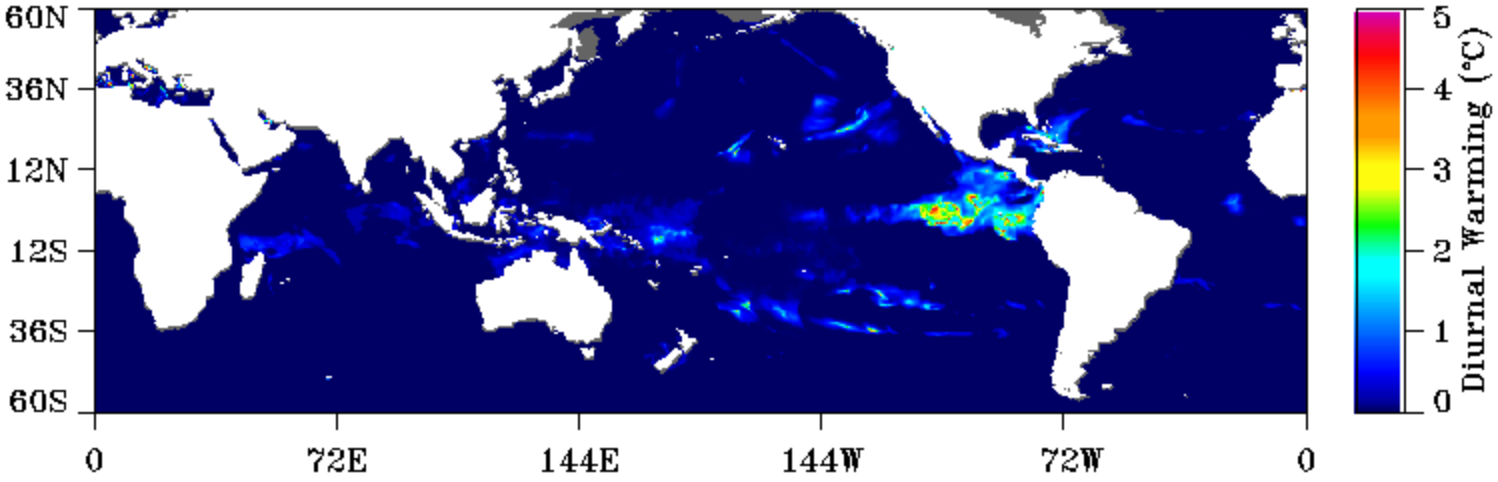
COARE Model

Diurnal Warming Evolution, 00-23 UTC, 21 March 2013



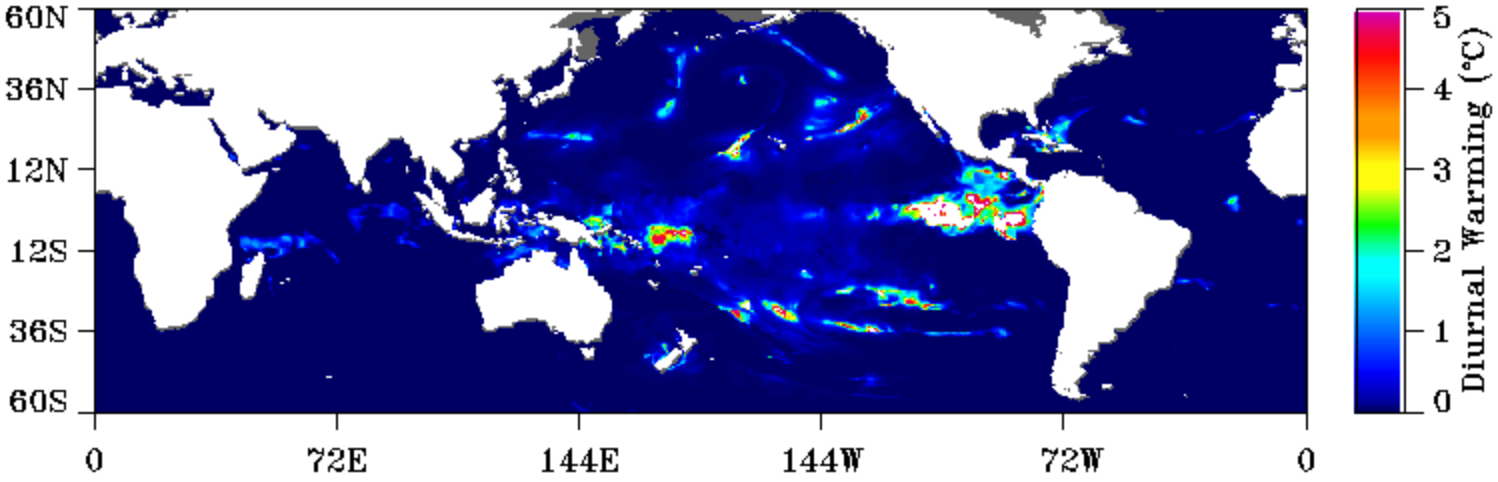
Kantha Clayson Stokes (Enhanced v2) Model

Diurnal Warming Evolution, 00-23 UTC, 21 March 2013



Wick Blended Kantha Clayson Model

Diurnal Warming Evolution, 00-23 UTC, 21 March 2013

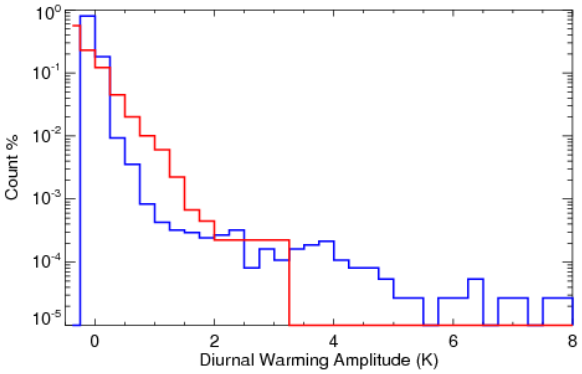


Comparison of Observed and Modeled Diurnal Warming

SEVIRI Domain – 21 March 2013

Kantha Clayson Model with Stokes Drift and Modified Constants (v2)

0200 UTC



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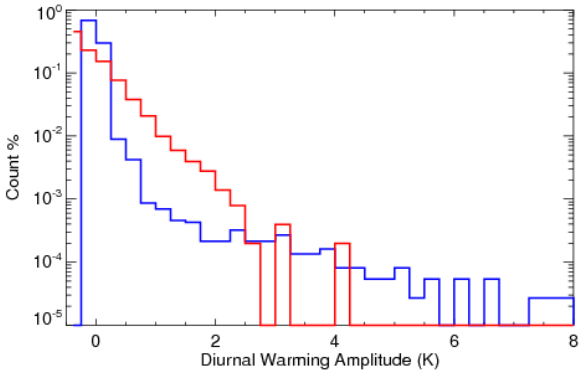

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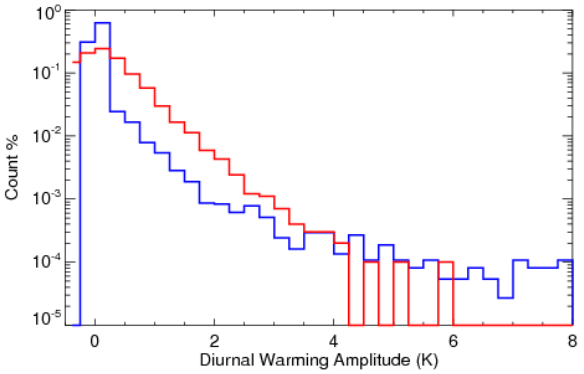

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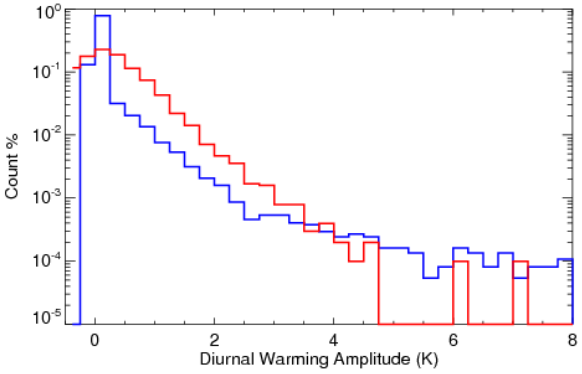

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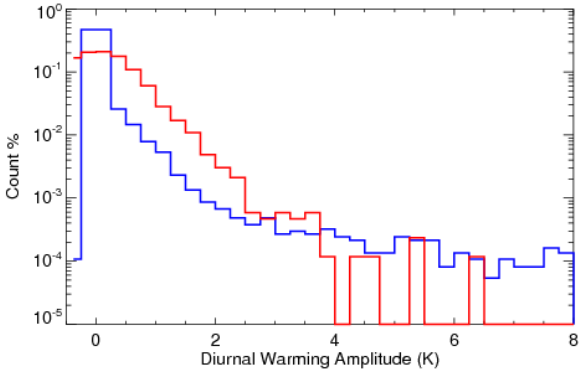

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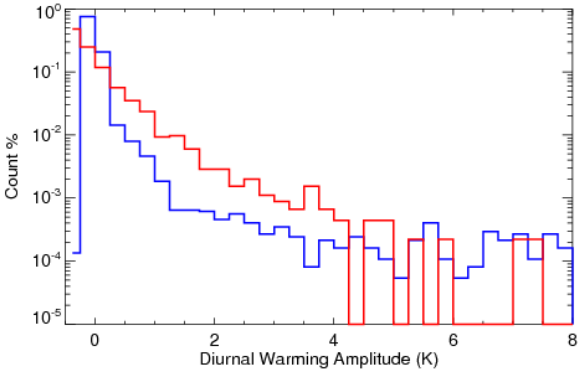
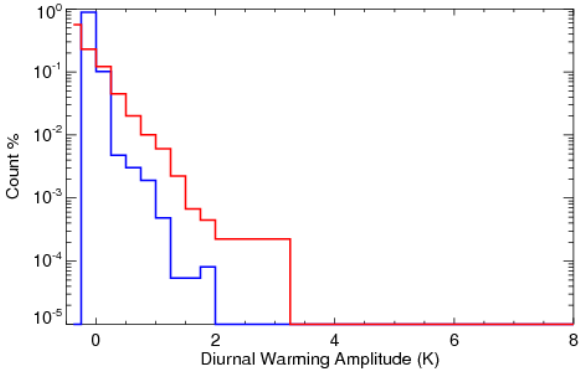


Comparison of Observed and Modeled Diurnal Warming

SEVIRI Domain – 21 March 2013

Wick Blended Kantha Clayson Model

0200 UTC



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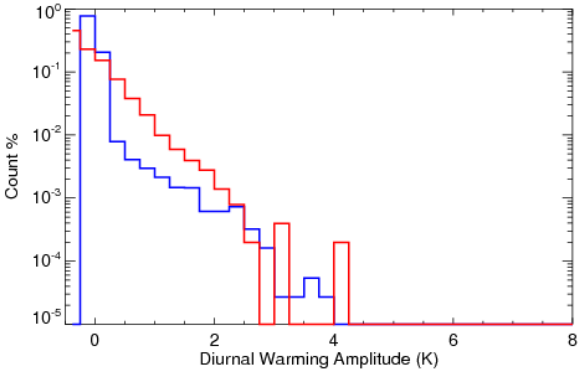

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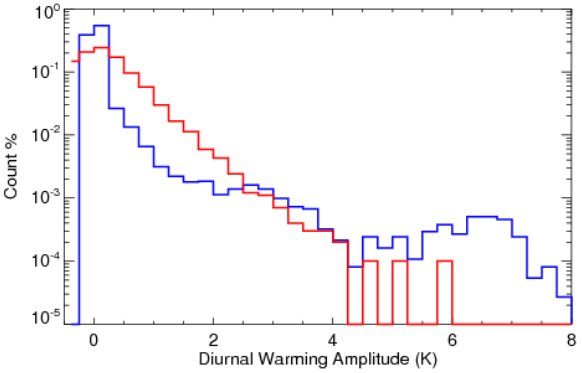

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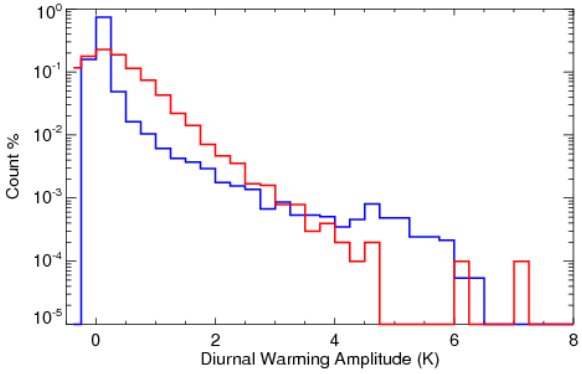

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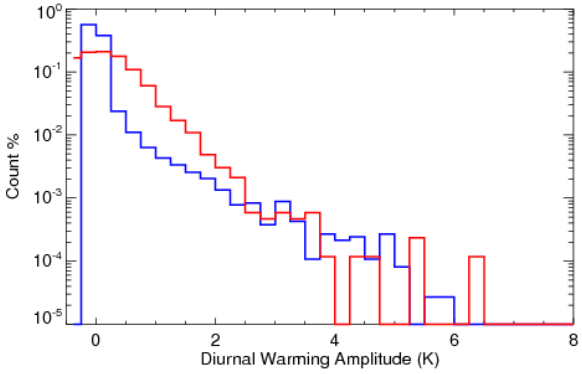

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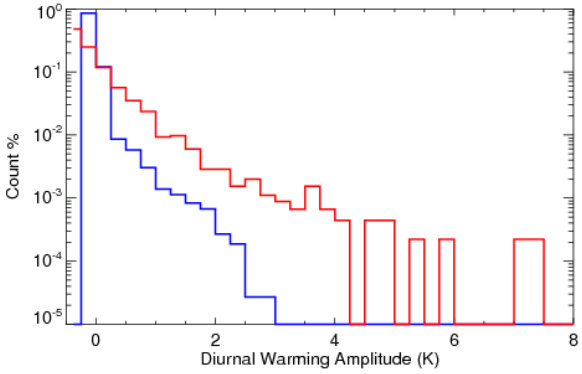
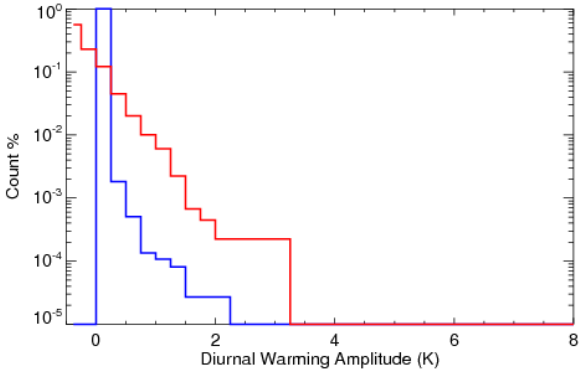


Comparison of Observed and Modeled Diurnal Warming

SEVIRI Domain – 21 March 2013

COARE Model

0200 UTC



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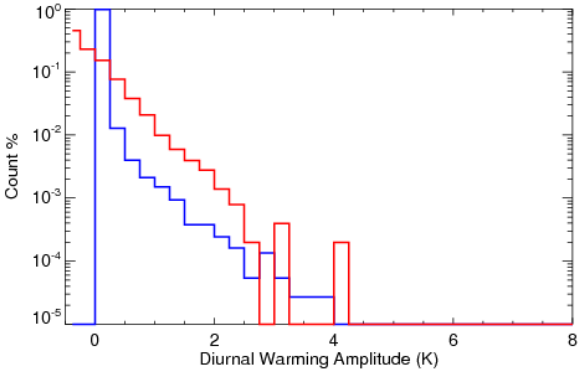

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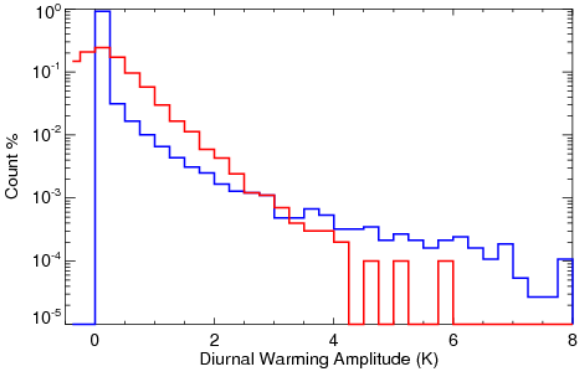

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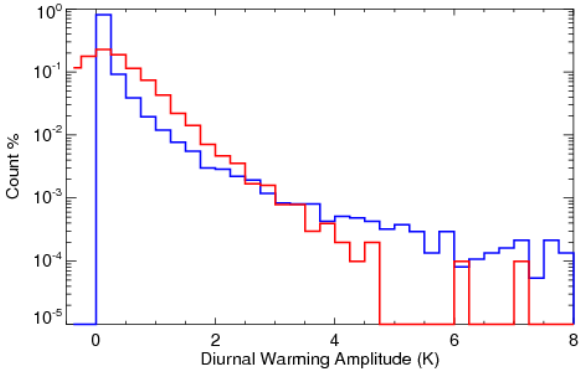

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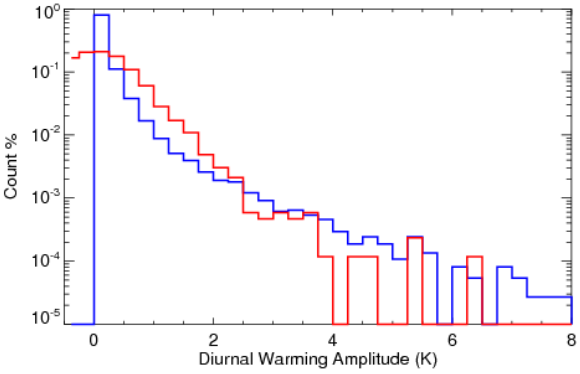

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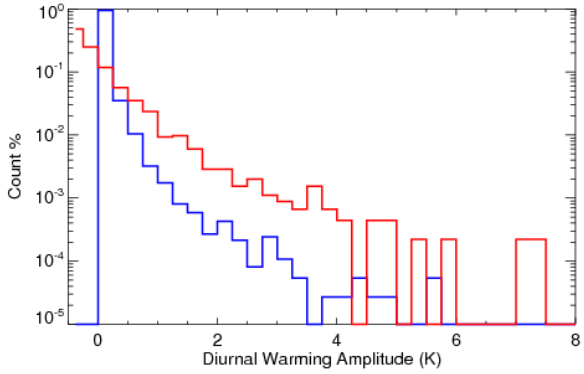
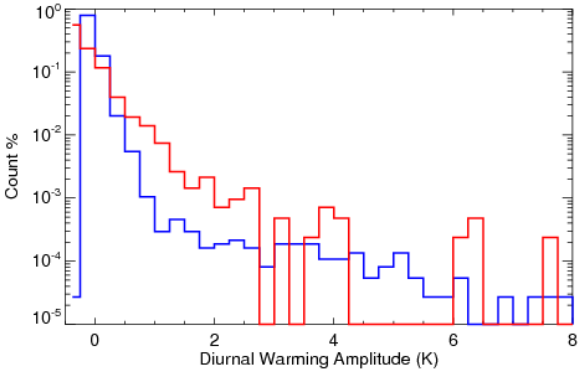


Comparison of Observed and Modeled Diurnal Warming

SEVIRI Domain – 22 March 2013

Kantha Clayson Model with Stokes Drift

0200 UTC



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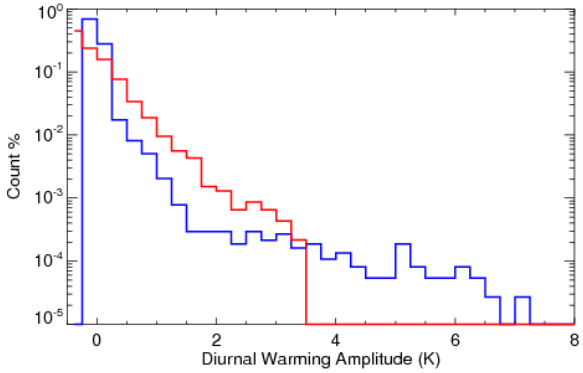

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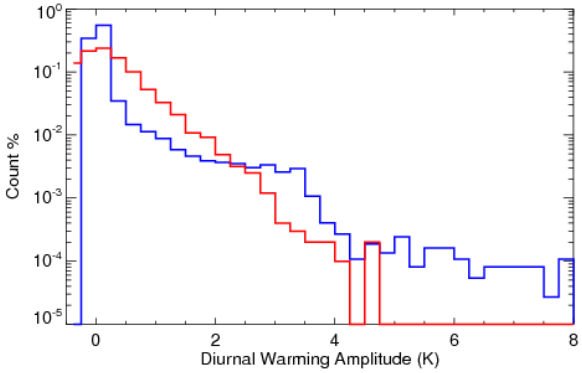

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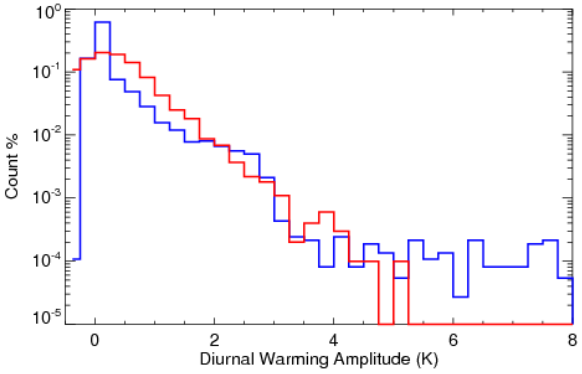

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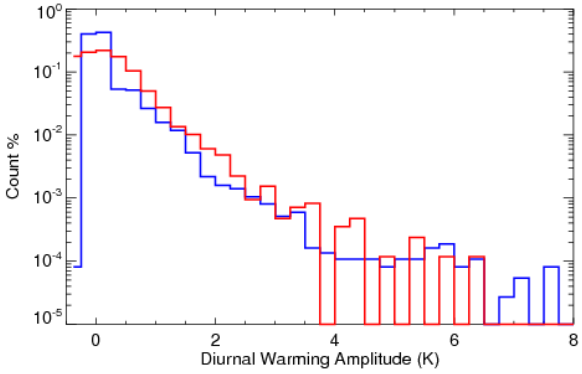

2200 UTC