



# MODIS Science Team Meeting

## Status of the MODIS Land-Surface Temperature/Emissivity Product: New Validations and Improvements

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# Validation of MODIS LST Products

## Credit also to:

Simon Hook (JPL), Zhao-liang Li (GRTR/LSIIT, France),

William C. Snyder (May 1995 – April 1997), Yulin Zhang (Dec 1994 -), Qincheng Zhang (July 2001 -),

Pengxin Wang (Sept 2001 – Feb 2002), Xialin Ma (Oct 1997 – Mar 2001), Ruibo Wang (Apr 1998 – May 2001), Yuezhong Feng (1997 – 1998).

## Special thanks for supports from

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Stan Hunewill and Jeff Hunewill (Hunewill Guest Ranch), Sophie Moreau (ABTEMA, Bolivia),

Arnaud Yves & Roland Bosseno (IRD, Bolivia), etc.





## Outline of the Presentation

Validations of the MODIS LST product

New improvements of the MODIS LST code

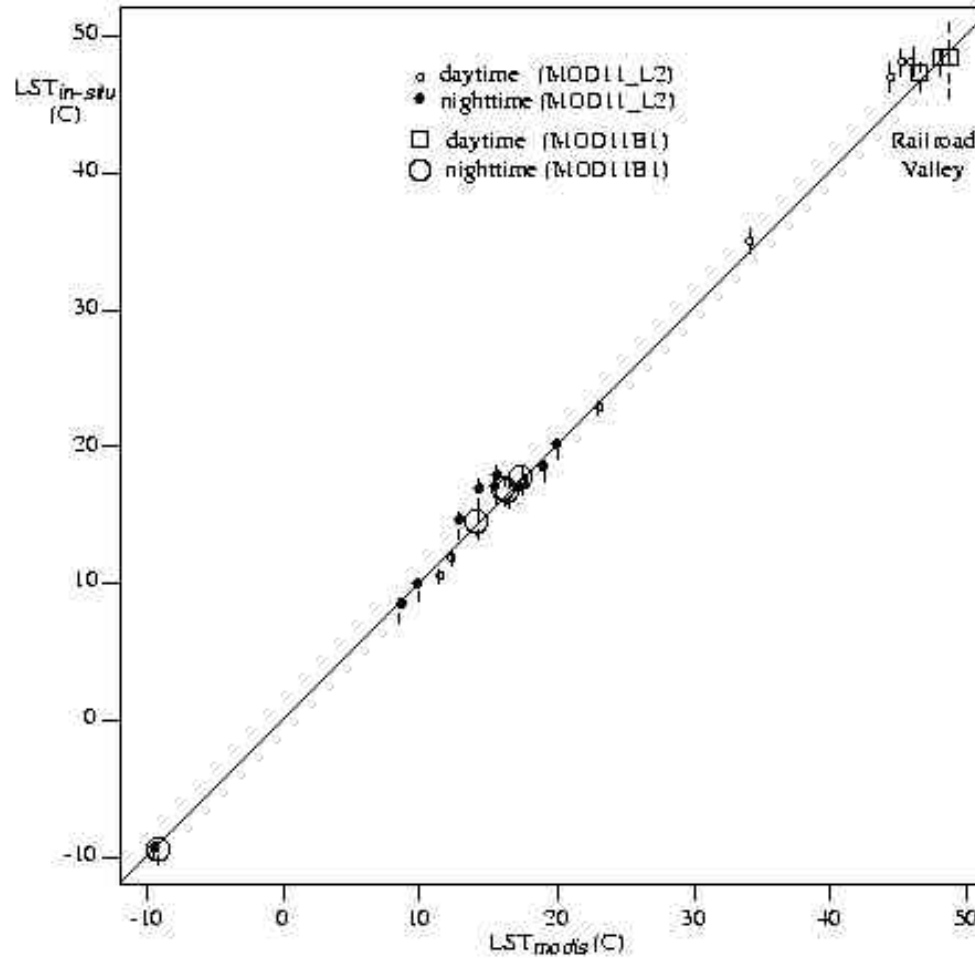
New LST results from Terra and Aqua MODIS data

Plan for the Fall of 2002

Conclusion of the MOD11 Status



# Validation results of the MODIS LST products



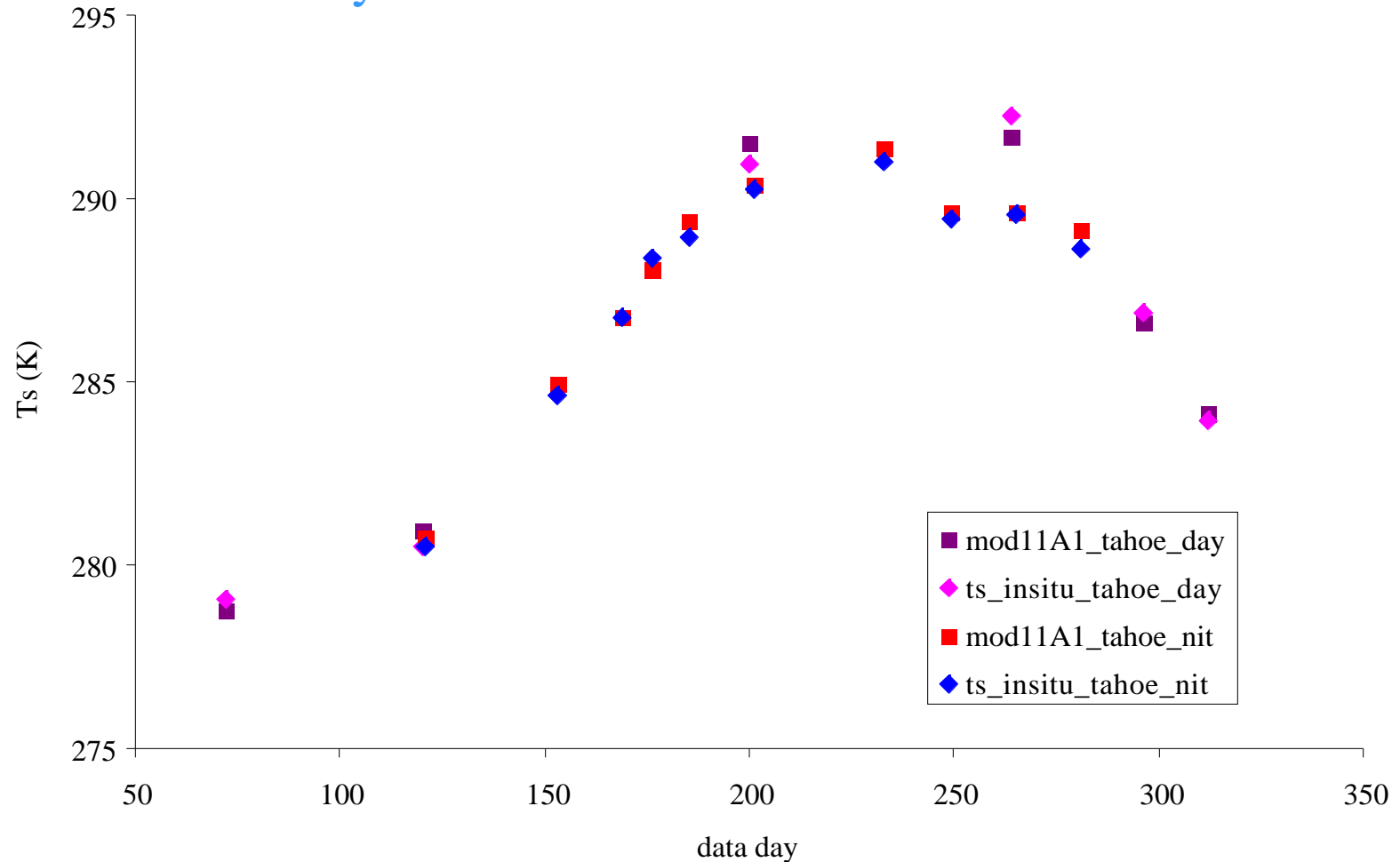
Comparison between the MODIS LSTs and the LSTs from in-situ measurements.

A LST validation paper is in press for Remote Sensing of Environment.





## Comparison of LSTs in MOD11A1 with those measured by Dr. Hook in Lake Tahoe in 2000



Seasonal variation shown by the MODIS LSTs at accuracy better than 0.6K.



Validation of the MODIS LST product in wet atmospheric conditions: (1) three TIR radiometers deployed in a rice field in State of Mississippi



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Validation of the MODIS LST product in wet atmospheric conditions: (2) five TIR radiometers deployed in a soybean field in State of Mississippi



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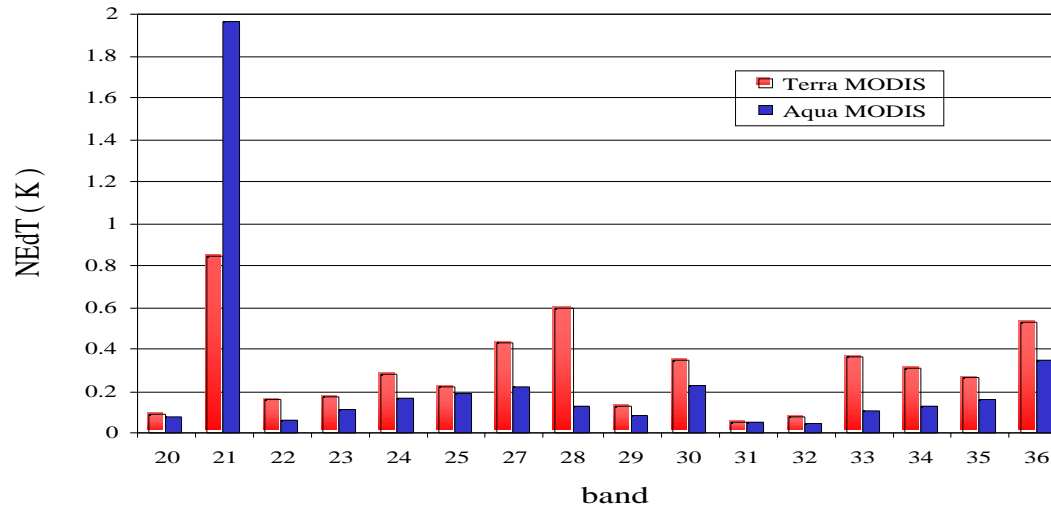
## New improvements of the MODIS LST code

1. Lake pixels in clear-sky at **MOD35** confidence 66% and higher are processed (per suggestions from Simon Hook and others).
2. Use the MODIS BRDF product (**MOD43B1C**) as input.
3. the range of viewing zenith angle separated into 5 sub-ranges (0-24, 24-38, 38-49, 49-58, 58-65) instead of 4.
4. Parallel processing for data of odd days and even days so that the production rate may be doubled.
5. The Terra and Aqua MODIS data may be used jointly in the day/night LST algorithm for better spatial and angular coverage.
6. A split-window method was incorporated into the day/night algorithm to ensure that the retrieved emissivities can be used by split-window algorithms.

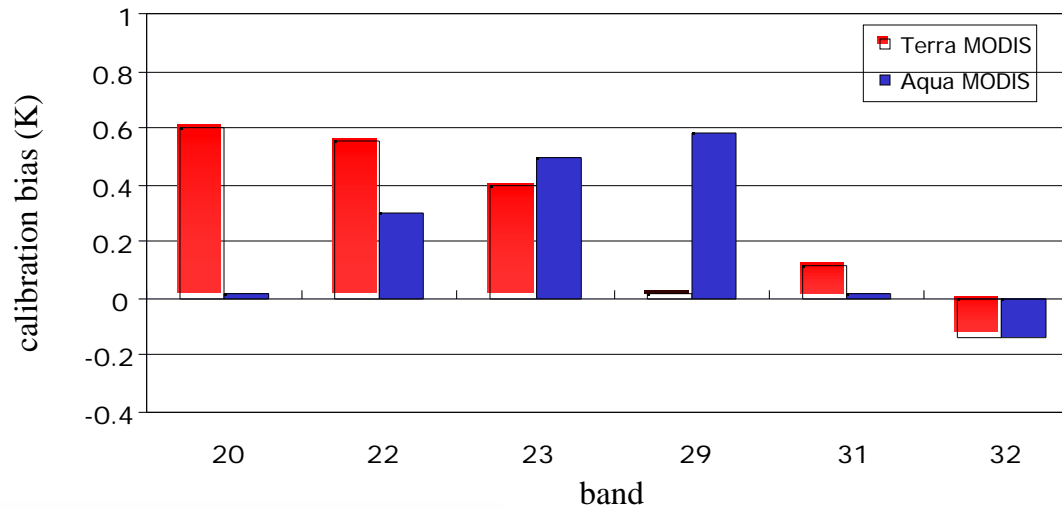




## Estimate of the NEdT and Calibration Accuracy of the early Aqua MODIS TIR data



Estimated NEdT values based on L1B granules MOD021KM.A2002177.0300 and MYD021KM.A2002177.0600 (June 26, 2002) over Lake Titicaca



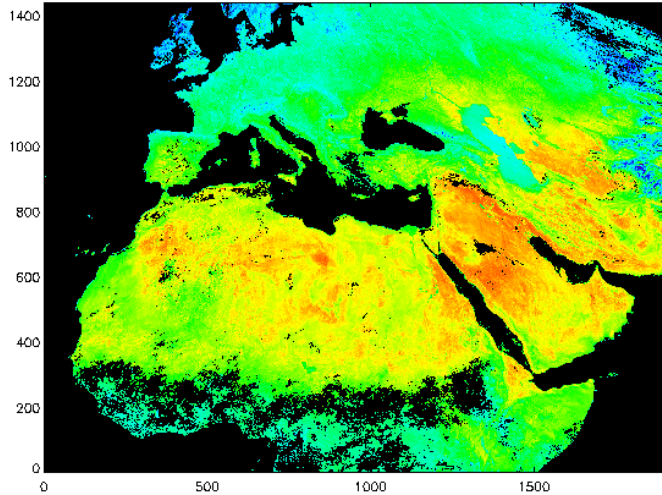
Estimated bias in calibration of MYD021KM.A2002177.0600 over Lake Titicaca compared with bias in Terra MODIS TIR bands (Wan et al 2002).



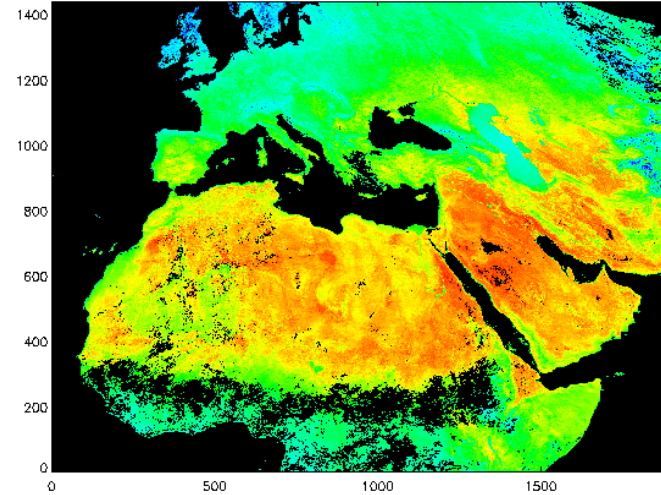


LSTs retrieved from Terra and Aqua MODIS data  
on data days 176-177 and 185-190 (06/25-26 & 07/4-9)  
to show spatial distribution of the diurnal variation

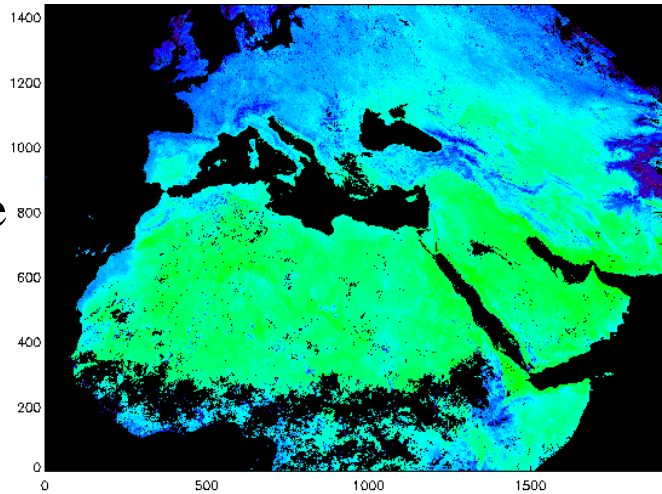
daytime  
Terra



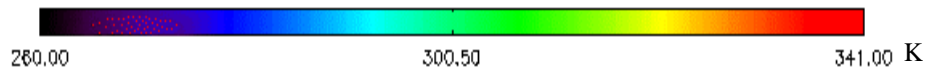
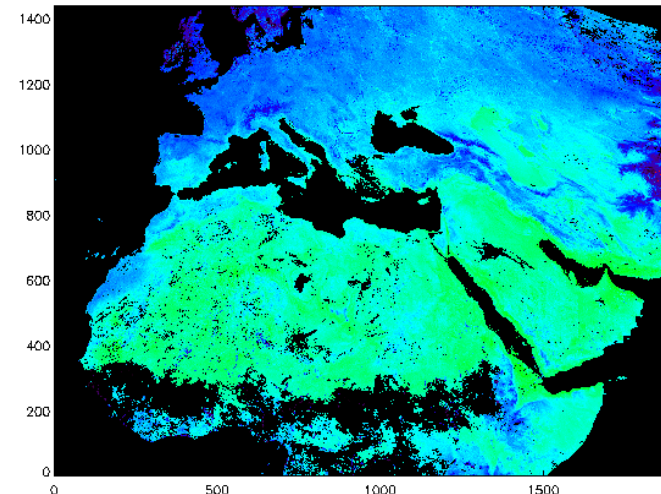
daytime  
Aqua



nighttime  
Terra



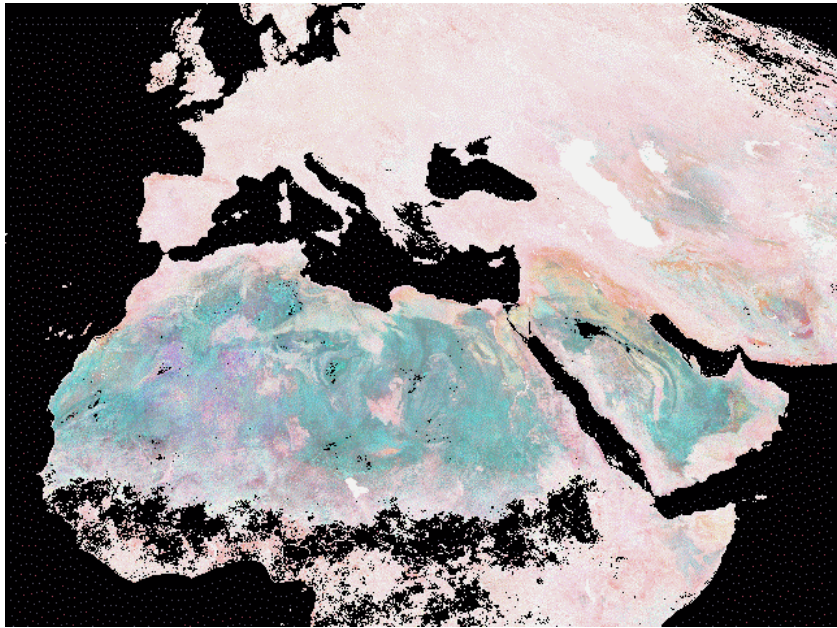
nighttime  
Aqua



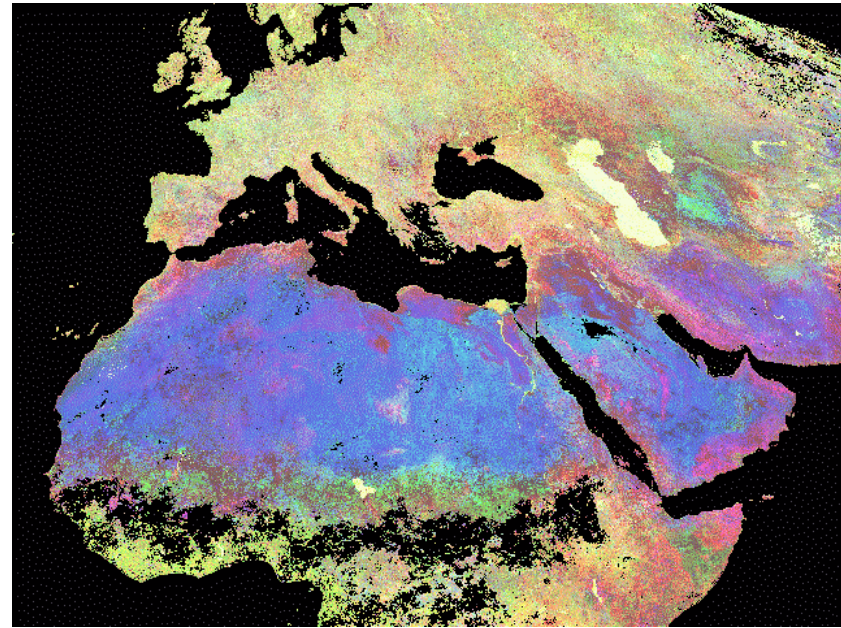




## Surface emissivities retrieved by Terra and Aqua MODIS in data days 176-177 and 185-190 (06/25-26 & 07/4-9)



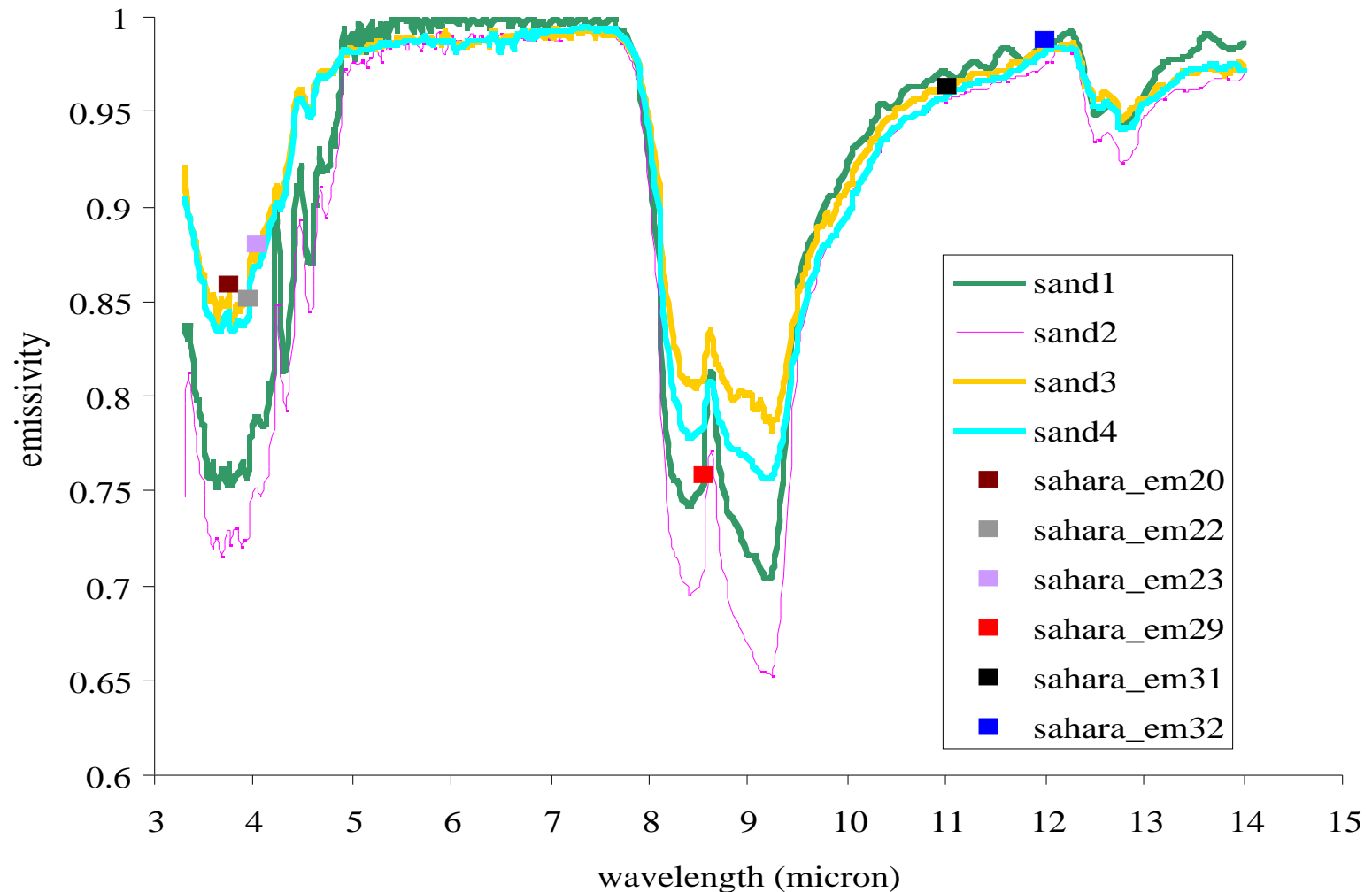
Color composite image with emissivities in bands 29, 22, and 20 as RGB components.



Color composite image with emissivities in bands 29, 31, and 32 **enhanced by the equalization histogram method** as RGB components.

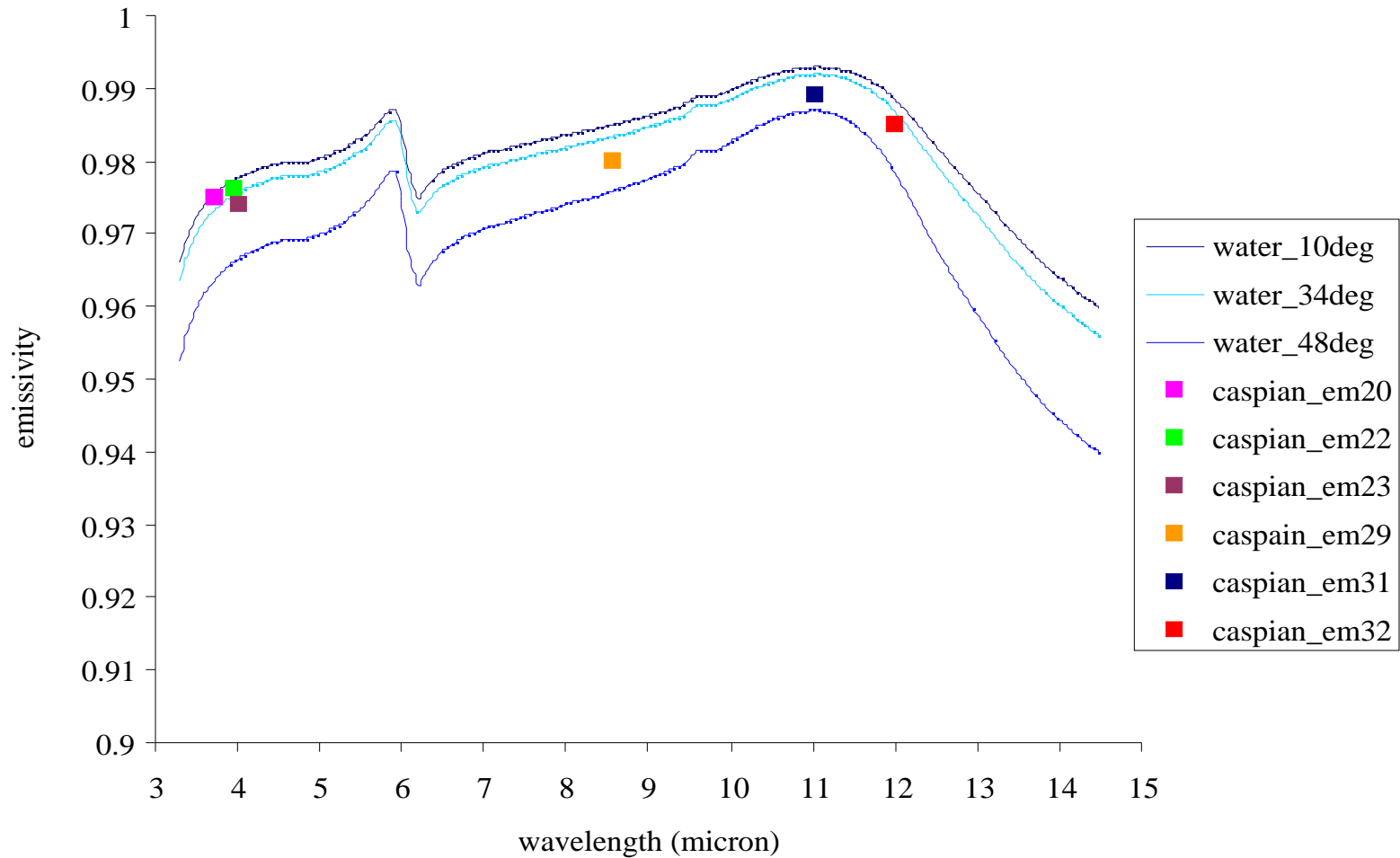


# Compare the retrieved surface emissivities over Sahara Desert to those measured from sand samples in the Lab





# Compare the retrieved surface emissivities in Caspian Sea to the calculated water surface emissivities







## Plan for the Fall of 2002

1. To validate the MODIS LST product in wet atmospheric conditions with field measurement data in State of Mississippi.
2. To conduct field campaigns in the areas of Mono Lake, Lake Tahoe, and Walker Lake in CA and NV in the period of August 5-16 with MAS day/night flights around the Terra and Aqua overpass times to estimate the calibration of Aqua MODIS TIR bands and to validate the MODIS LST product.





## Conclusion of the MOD11 Product Status

1. The LST products were validated within 1K with in situ LSTs in 19 cases (including 14 cases over land sites) in the LST range of 263-322K and the atmospheric cwv range of 0.4-3.0cm, and Simon Hook's Lake Tahoe data in 2000-2002.
2. Validated MODIS LST products will be generated in the next reprocessing (collection 4 by Oct. 2002) while validation activities will be continued especially for the Aqua MODIS LST products.