

Improvements of AMSR-E SST by Considering Air-sea Temperature Difference

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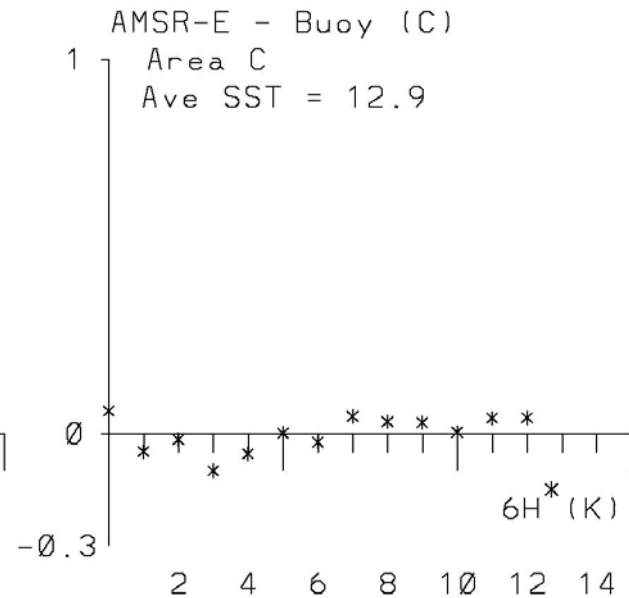
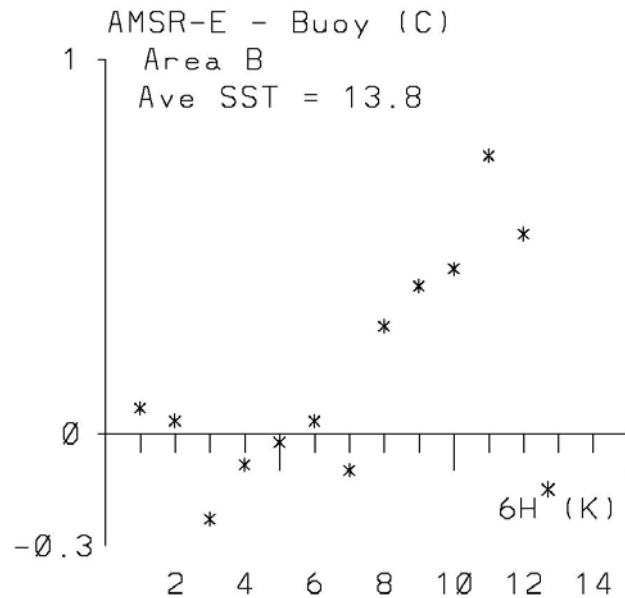
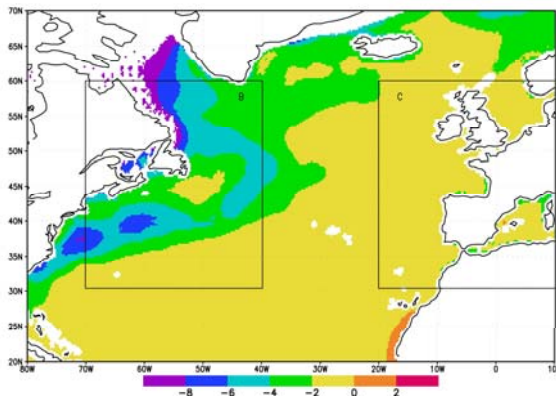
US-Japan AMSR-E meeting, Sep. 6-8,2006, at San Diego

Background

AMSR-E SST is overestimated over oceans where air-sea temperature is negative, and strong wind blows.

AMSR-E SST error

Atlantic Ocean



air-sea temperature difference

→ **stronger wind**

Sensors and Data

AMSR / AMSR-E

SeaWinds on ADEOS-II

Air temperature

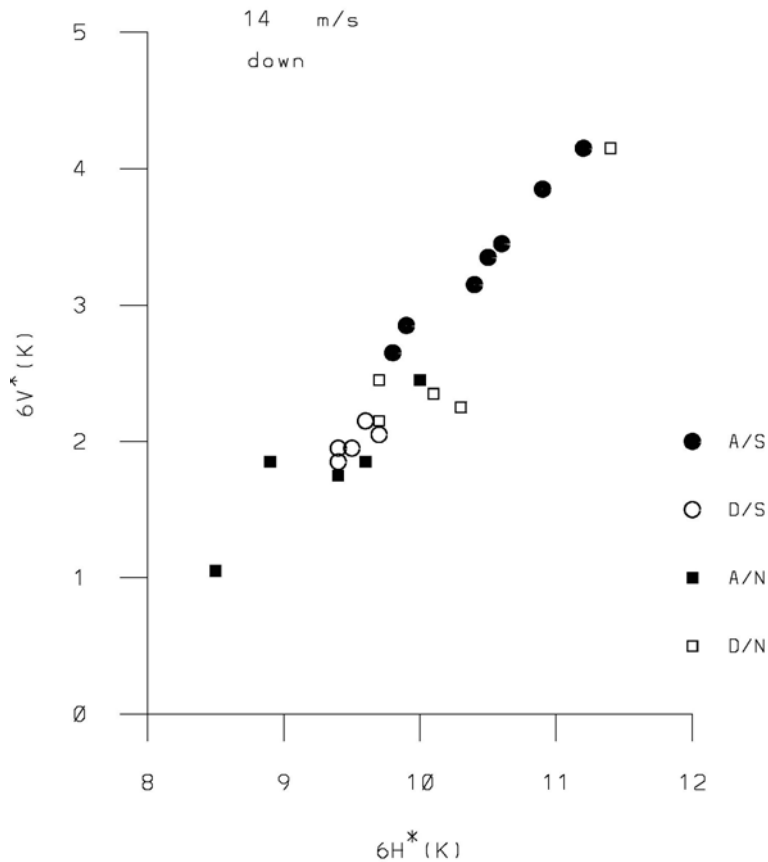
GANAL JMA weather forecast model

Parameter definition

$$\mathbf{6V(H)^* = amsr_6V(H) - atmos_effect_6V(H) - calm_ocean}$$

Tbs changes during seven months of ADEOS-II

- under strong wind speeds -

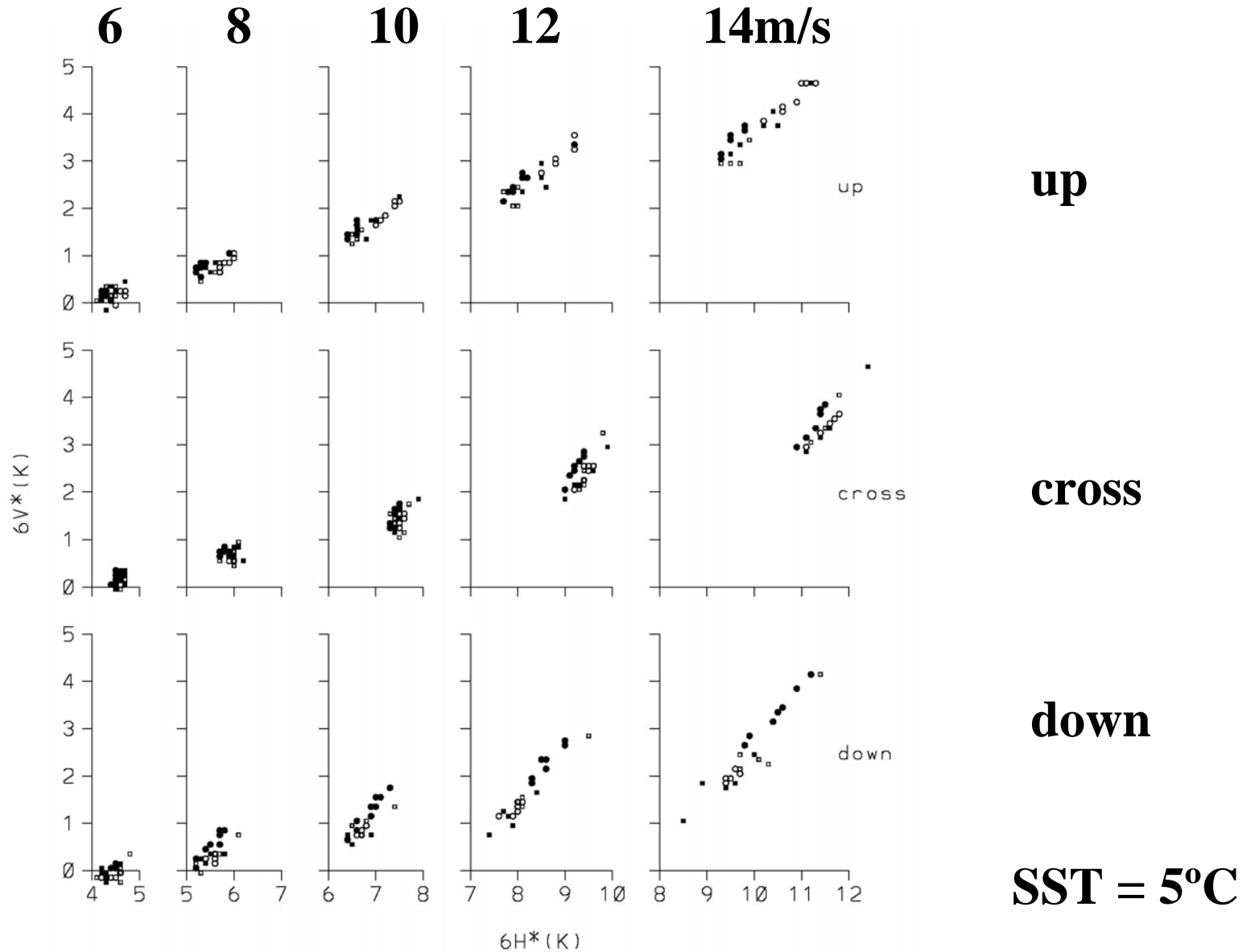


Monthly averaged Tbs of $6V(H)^*$ for seven months, separately for A/D orbits, and for N/S hemispheres.

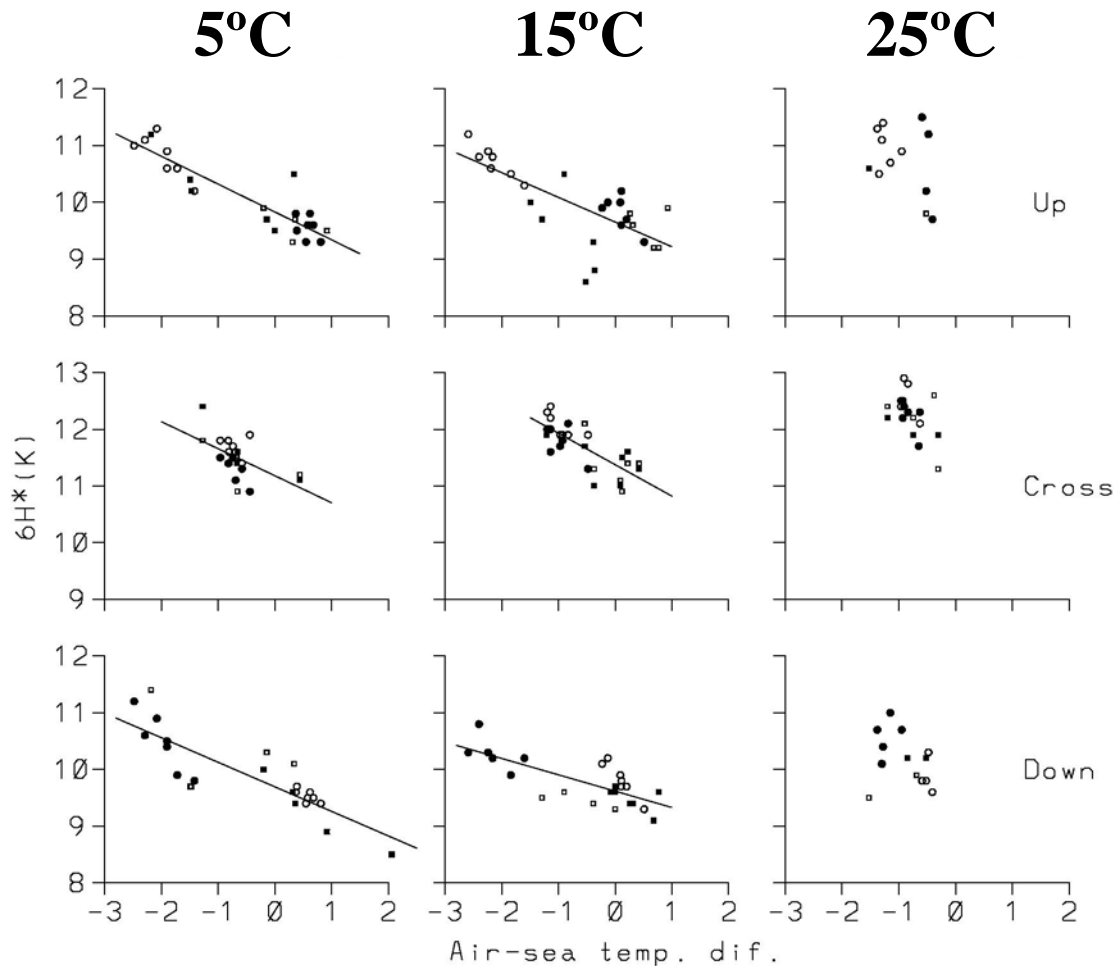
SeaWinds wind speed 14m/s
Down-wind direction
SST = 5°C

Changes of Tbs may be due to ocean foams

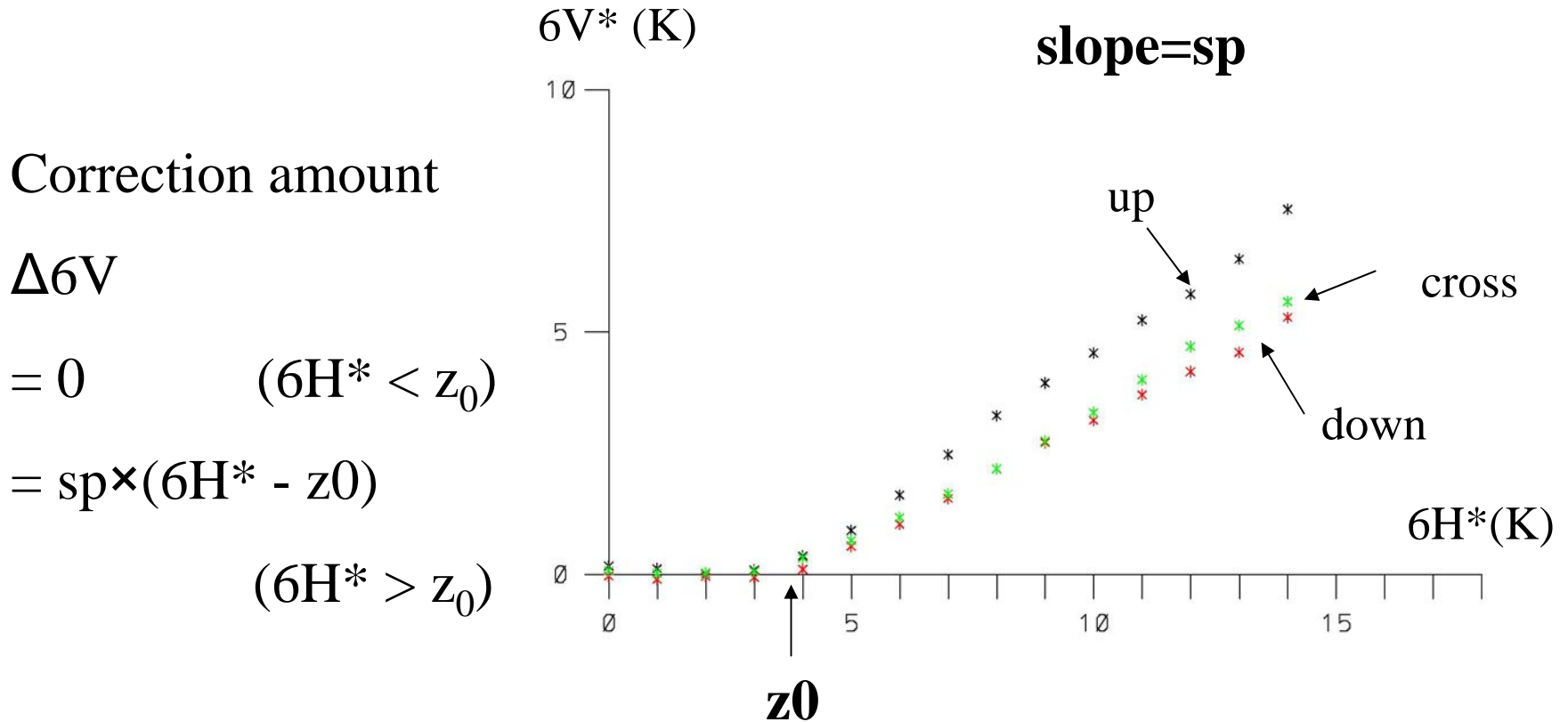
Tb changes for various wind speeds and relative wind directions



Relation between $6H^*$ and air-sea temperature difference at three SSTs and three relative wind directions



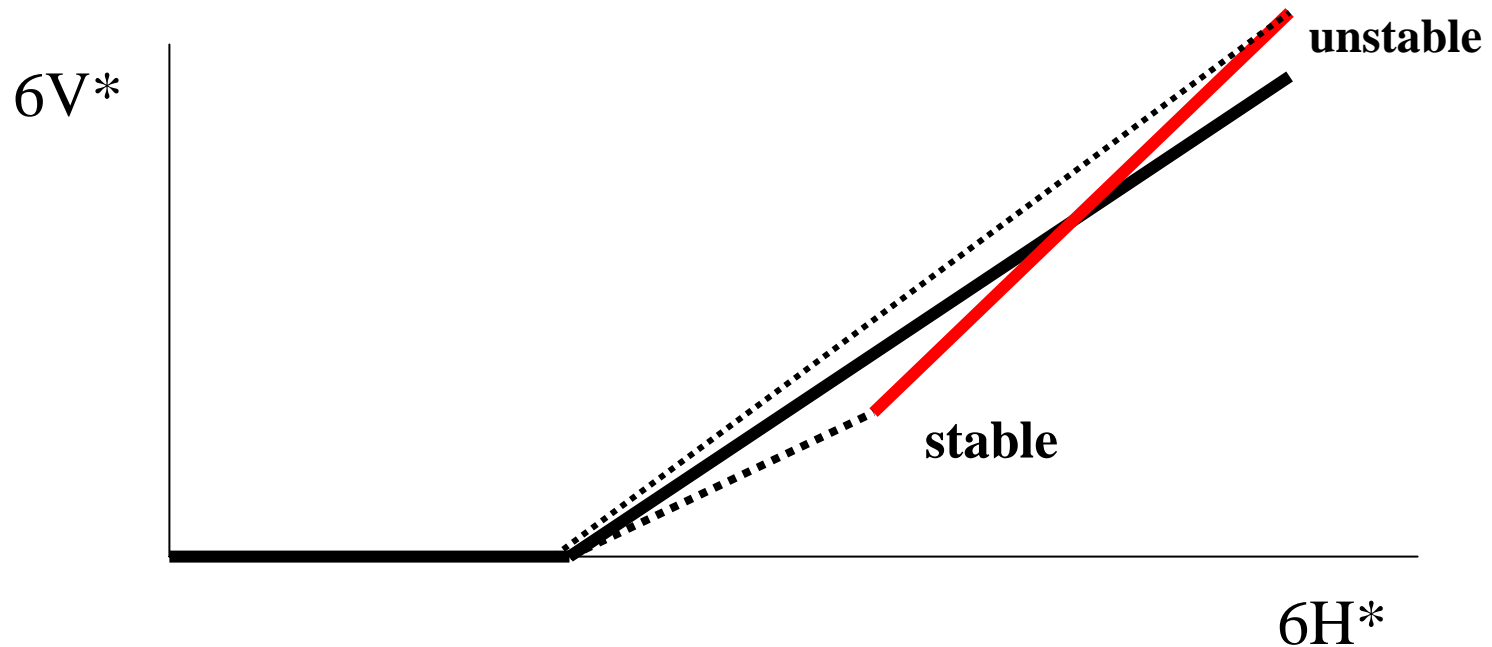
Method of correcting wind effect on 6V in AMSR SST algorithm



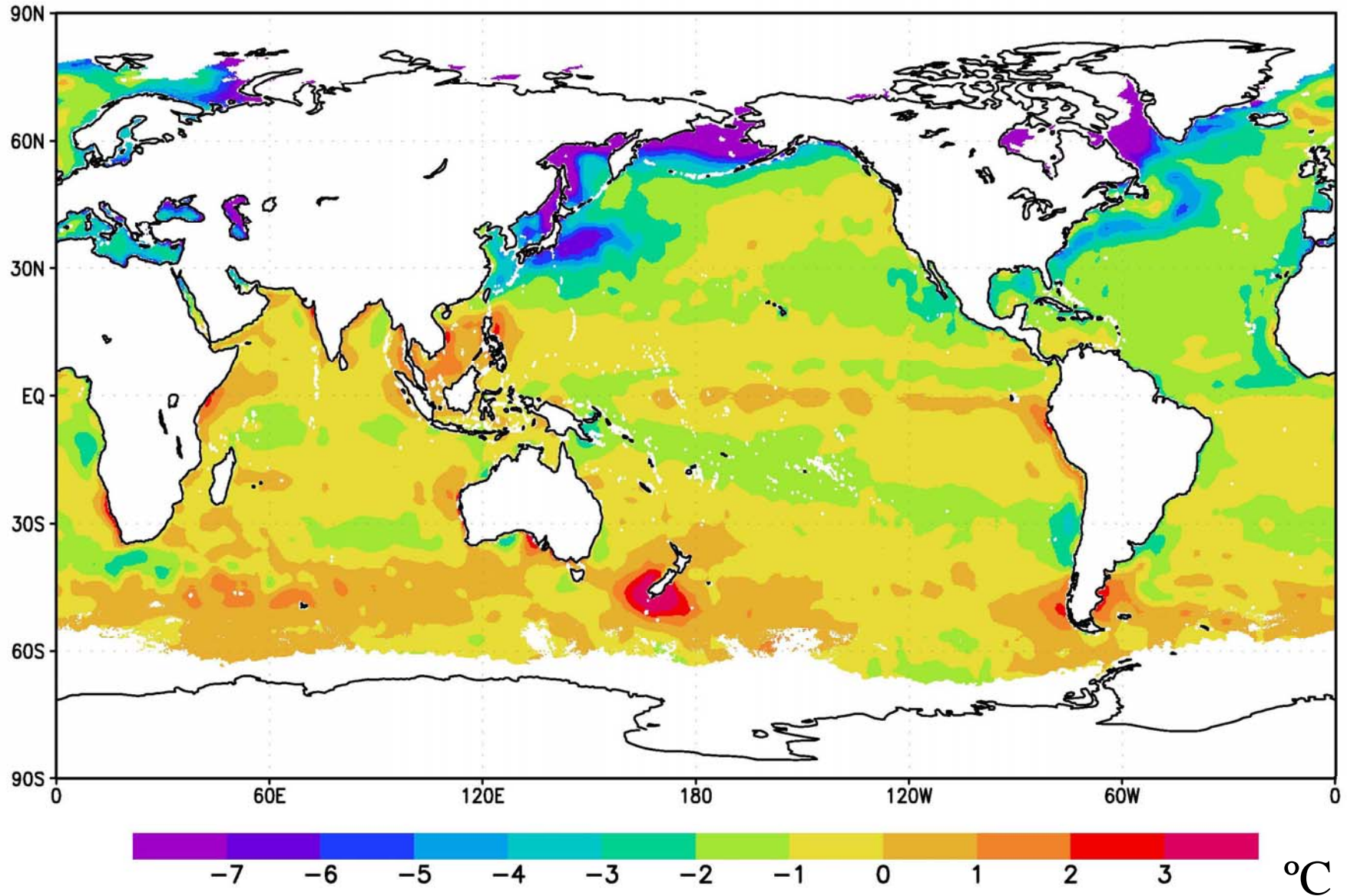
Relative wind direction was determined by SeaWinds

Effect of air-sea temperature difference on an amount of the wind correction

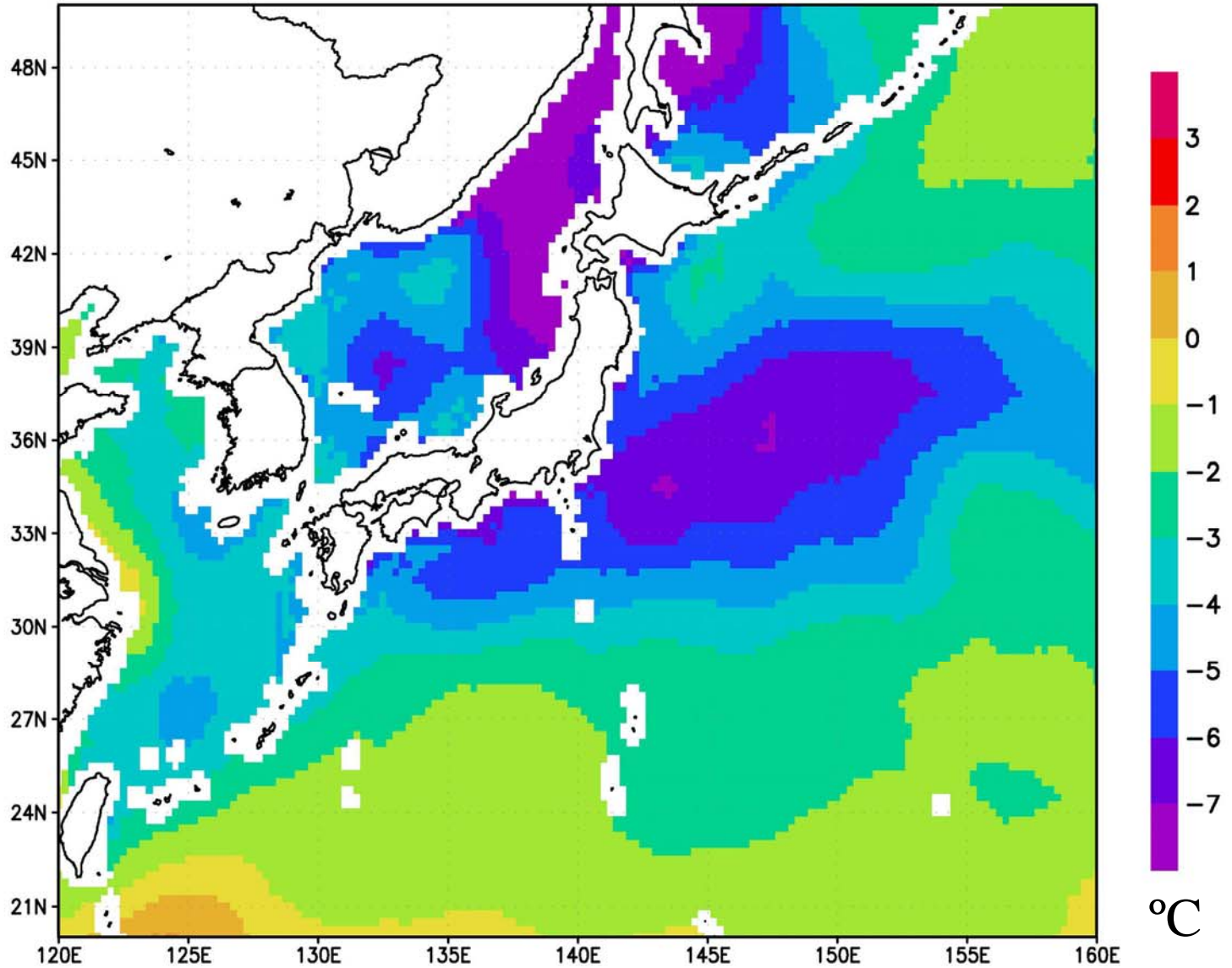
One example (air-sea temp. dif. -6°C , wind
speed 14m/s , up-wind) \rightarrow SST 1.5°C positive



Monthly mean of air-sea temperature difference in January 2006



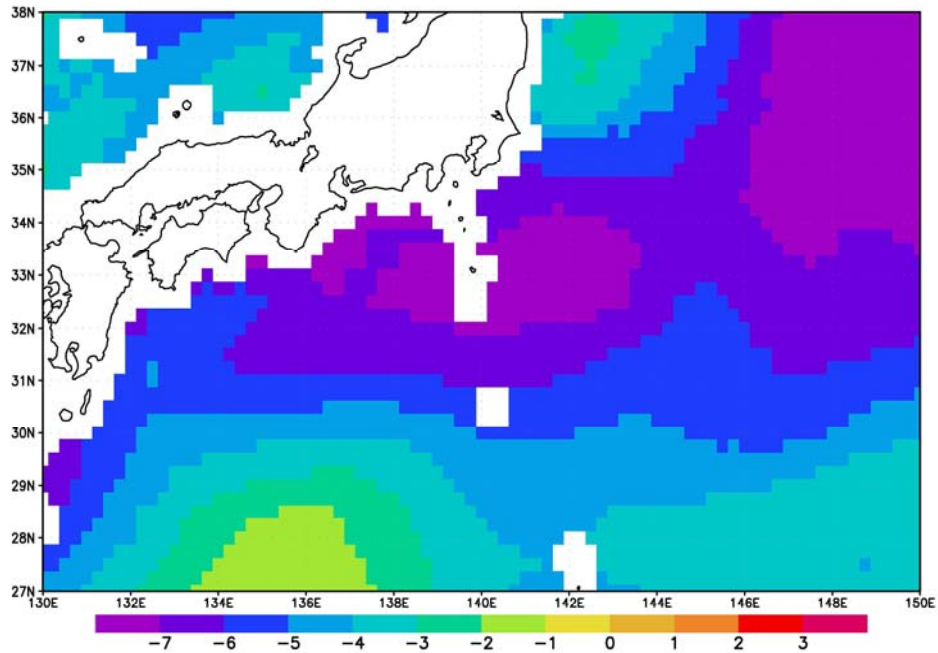
Around Japan



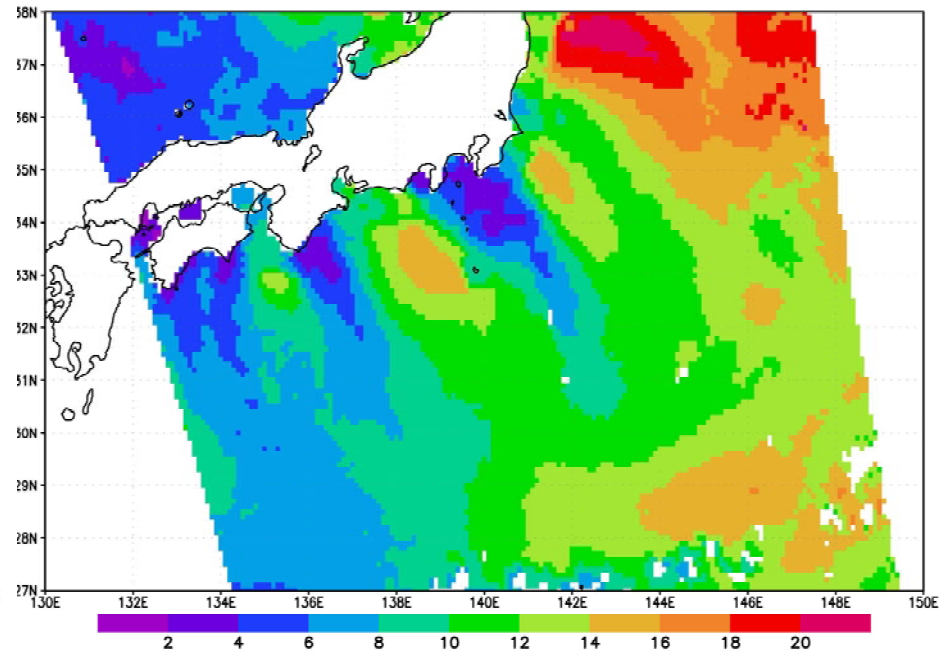
Example of air-sea temperature effect on AMSR SST in Kuroshio Current region

Example on 26th Jan. 2006

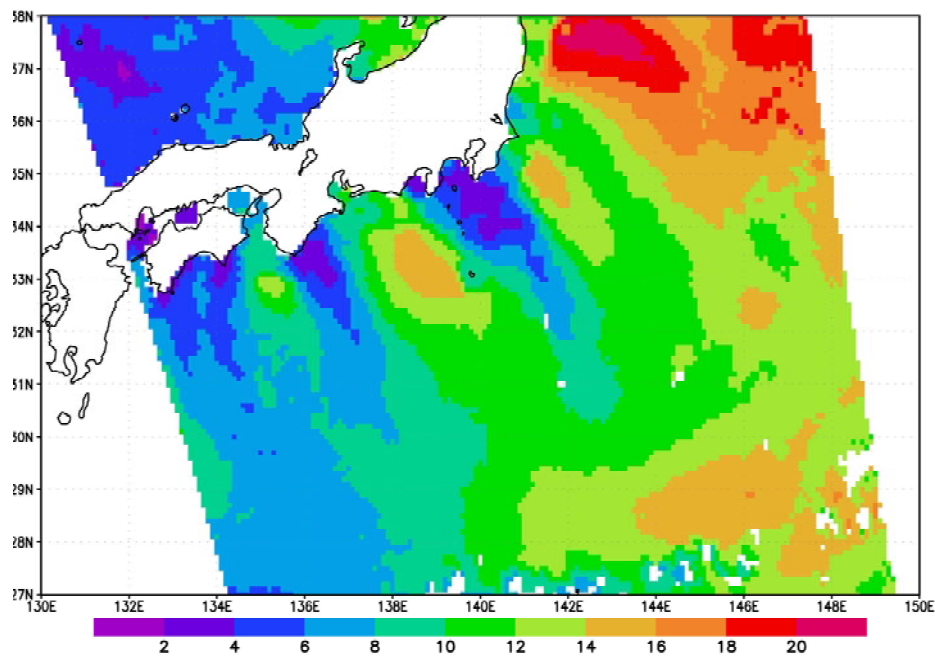
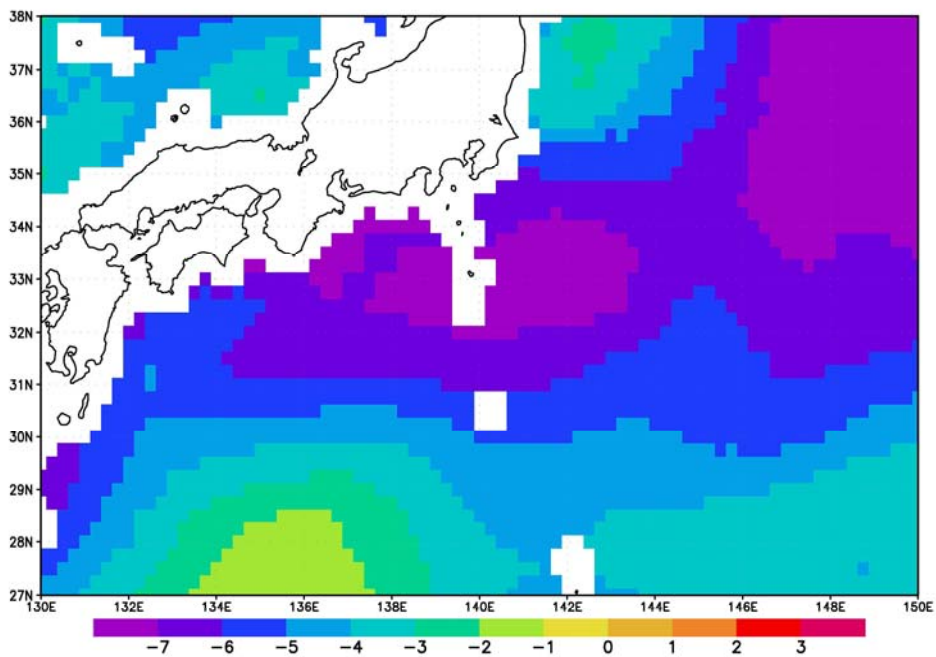
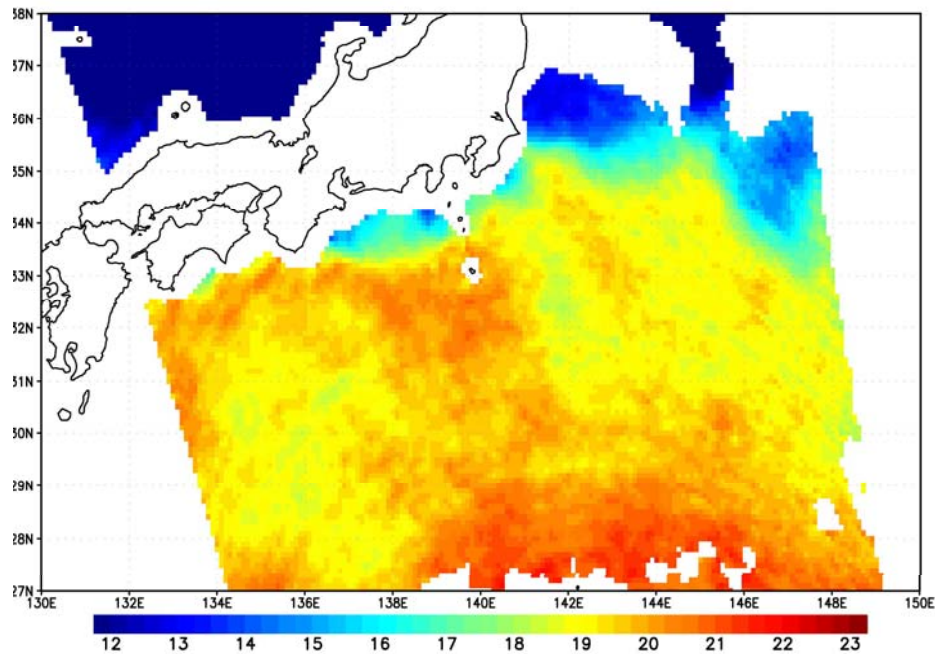
Air-sea temperature difference (°C)

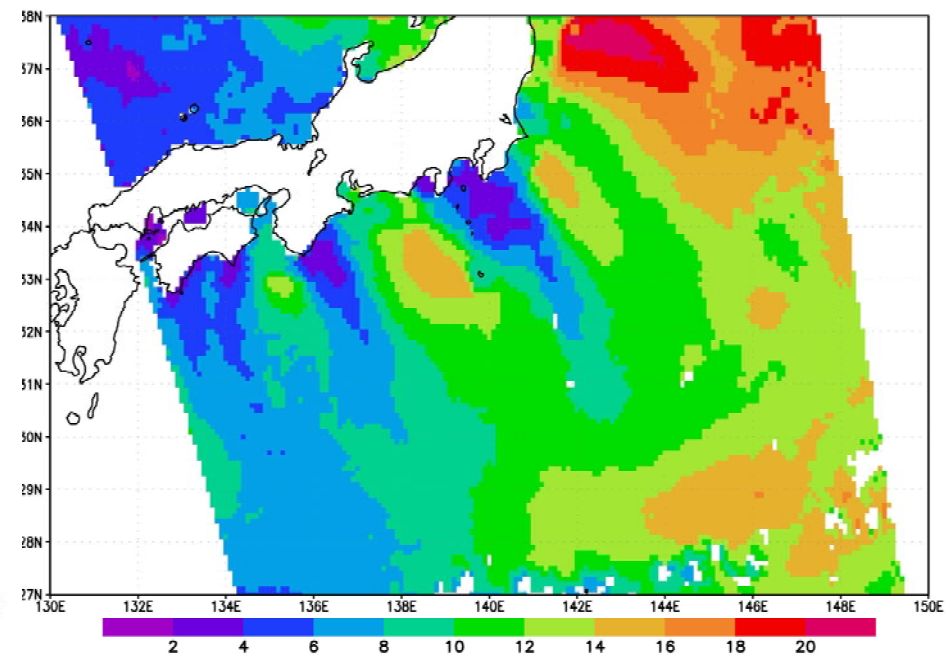
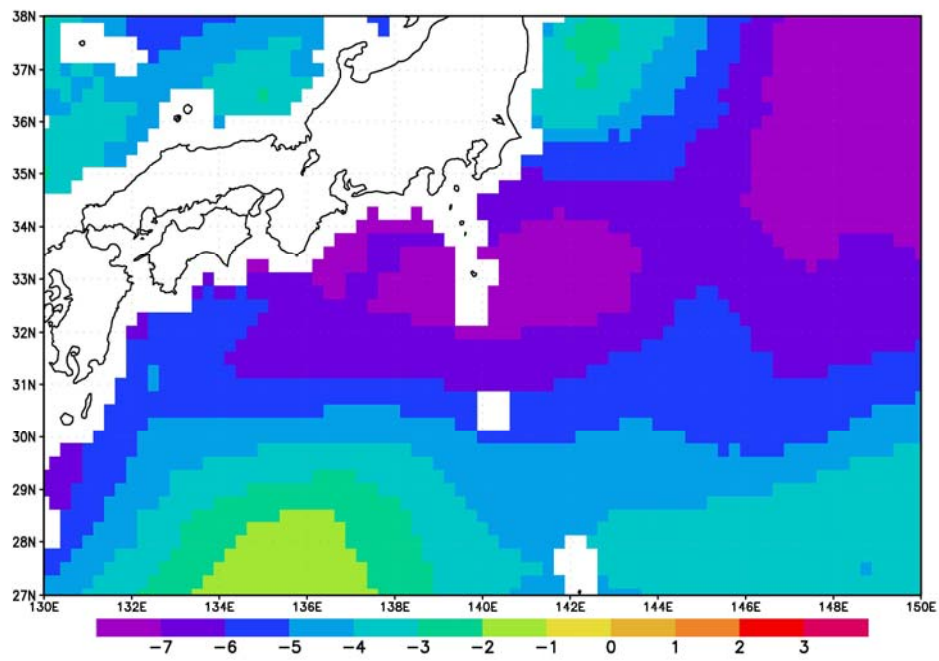
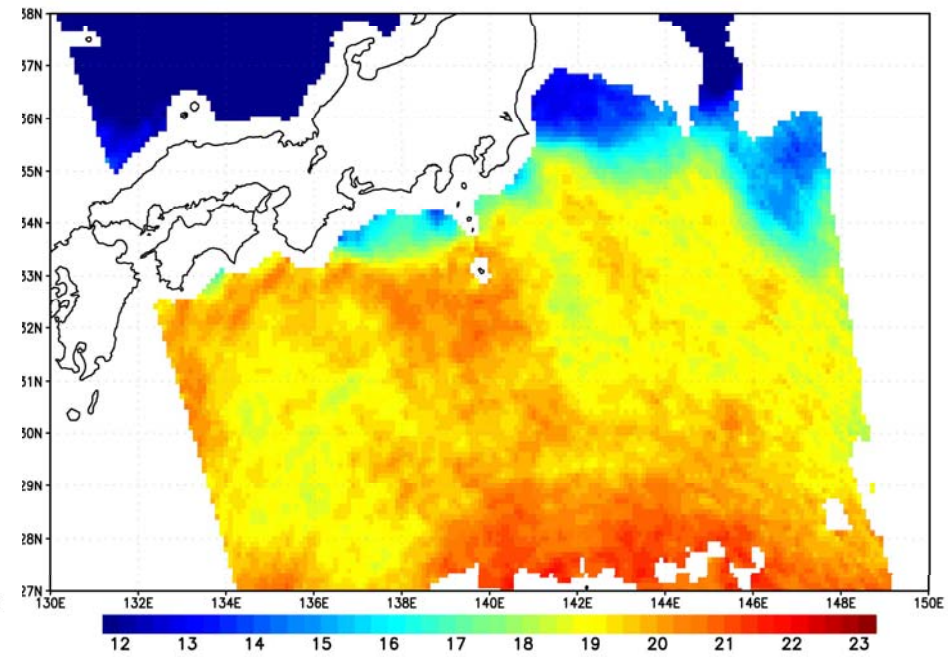
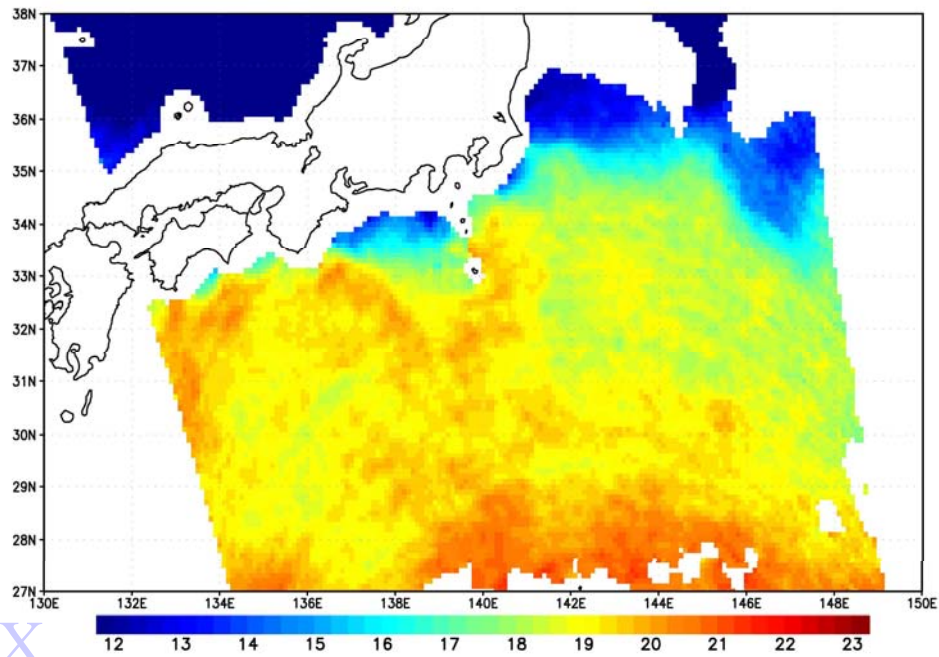


AMSR wind speed (m/s)



AMSR-E SST (°C)





Comparison of AMSR-E SST accuracy in global ocean without or with taking account of air-sea temperature difference

monthly rms (°C) for Feb. 2003

0.583 **sp constant in global ocean**

0.552 **sp changes both seasonally and
in latitude (current version)**

0.533 **sp changes with air-sea
temperature difference both
spatially and temporally using
GANAL**

Conclusions

- **Ocean microwave emission (Tbs) changes with air-sea temperature difference for wind speeds over 6m/s. Changes of Tbs may be due to ocean foams.**
- **Air-sea temperature difference affects the accuracy of AMSR SST under two conditions imposed: large negative (or positive) air-sea temperature difference and strong wind conditions.**
- **SST errors due to air-sea temperature difference can be reduced by using GANAL air temperature.**