SYSTEMATIC AND RANDOM ERROR CORRECTION OF SHIP BASED MARINE METEOROLOGICAL PARAMETERS OBSERVED ACROSS TROPICAL INDIAN OCEAN

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INCOIS

THE NET HEAT FLUX ACROSS TROPICAL INDIAN OCEAN IS REDUCED BY 14 W/M^2 UPON APPLYING A SYSTEMATIC ERROR CORRECTION FOR WIND SPEED AND RANDOM ERROR CORRECTION FOR SEA LEVEL PRESSURE, AIR TEMPERATURE, SEA SURFACE TEMPERATURE, DEW POINT TEMPERATURE.

MaMetAtTIO – A brief outline

- **Individual records of marine-met data obtained from IMD are combined with individual observations of ICOADS R3.0 and is used in the preparation of marine-met climatology for TIO (MaMeATIO)**
- **Annual climatologies , monthly climatologies and individual year-month summaries of following variables are constructed at a resolution of 1° x 1° across 20°E-120°E and 30°S-30°N.**

Dry bulb temperature 10 m	U-Momentum Flux
Specific Humidity 10 m	V-Momentum flux
Sea surface temperature	Latent Heat flux
Zonal Wind speed 10 m	Sensible Heat Flux
Meridional Wind speed 10 m	Longwave radiation
Sea level pressure	Shortwave radiation
Cloud amount	

METHODOLOGY – PREPARATION OF CLIMATOLOGY

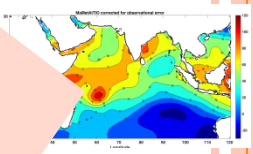
Three levels of duplicate check

QC check under MQC guidelines; Land masking; STDEV trimming;

Height correction of WS, DBT, SPHUM to 10m;

Correction for observation errors(systematic and random errors)

Cressman iterative difference-correction scheme with Barne's weight function ; Non-linear filter : median of grid values in a 3^0x3^0 box & Shapiro filter



SYSTEMATIC ERROR CORRECTION : CORRECTION TO BEAUFORT ESTIMATED WIND SPEED OVER THE TROPICAL INDIAN OCEAN

Anemometer measured wind speeds (M-WS) converted to 10 mt height

M-WS and Beaufort estimated (E-WS) are gridded separately for annual, JAN, APR, JUL, OCT periods

For each period a relationship of the form $y=ax+bx^{1/2}$ is regressed. (x:E-WS; y:M-WS)

The derived correction is applied upon E-WS of all periods and gridded again (E2-WS)

The measured WS (M-WS) and corrected estimated WS (E2-WS) are compared and the regression coefficients giving the best statistics is chosen

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RESEARCH ARTICLE

Correction to Beaufort-estimated wind speeds over the Tropical Indian Ocean

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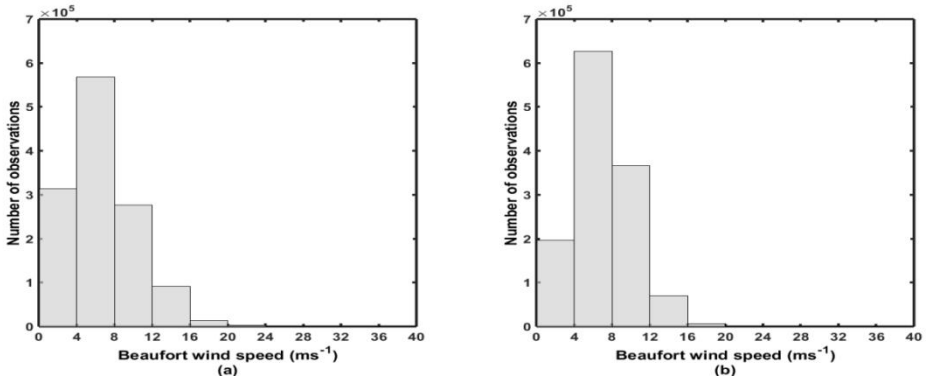
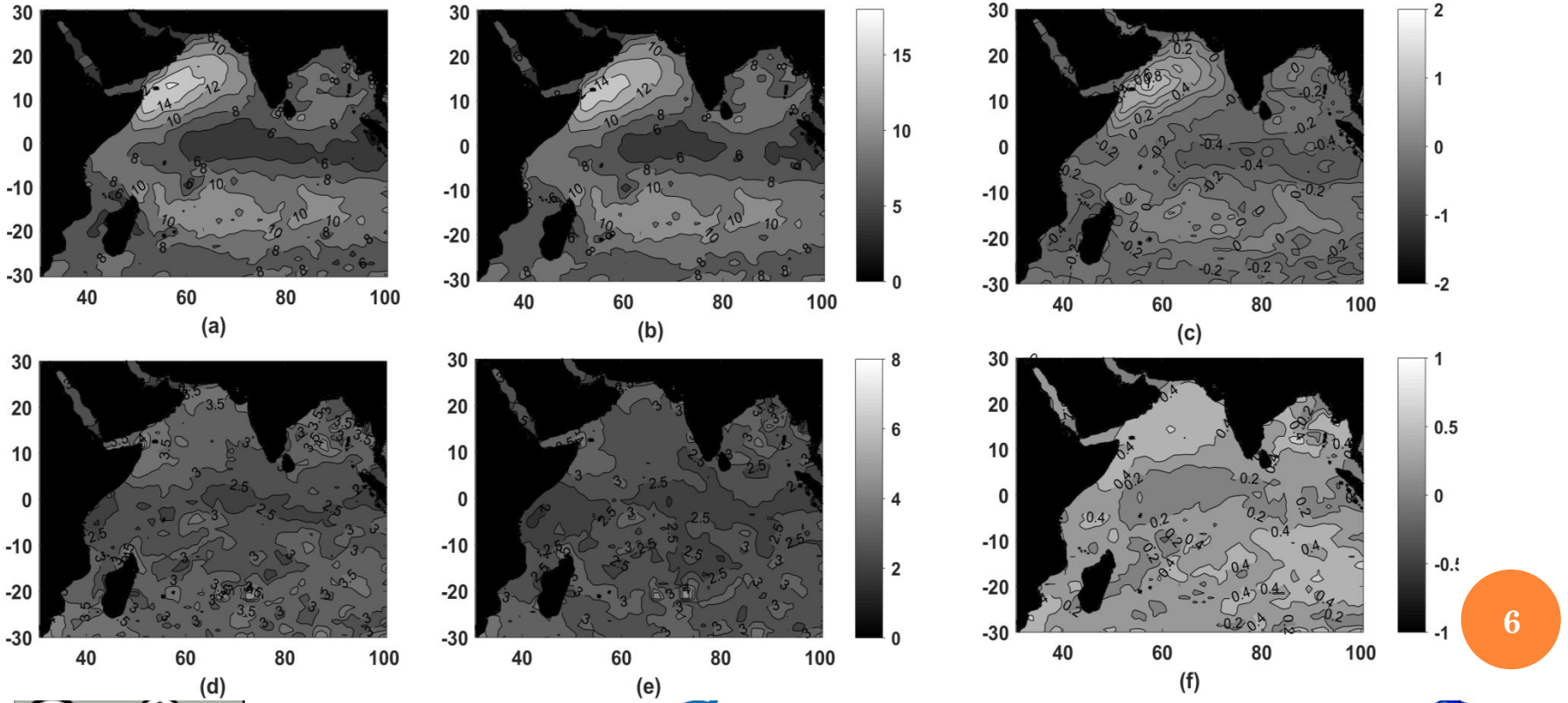
The Beaufort Scale was used to estimate wind speeds (WSs) over oceans before the introduction of ship-mounted anemometers. Beaufort-estimated WSs form a

SYSTEMATIC ERROR CORRECTION : CORRECTION TO BEAUFORT ESTIMATED WIND SPEED OVER THE TROPICAL INDIAN OCEAN

$$W_{new} = 0.5600 * W_{beaufort} + 1.3906 * (W_{beaufort})^{1/2}$$



July climatology of WS(a,b) and pseudo stress(d,e) before and after correction



RANDOM ERROR CORRECTION

- Correction of independent observations of DBT, SLP, SST, DPT for random error is done using **semivariogram analysis technique** following Kent *et* al.1999
- The procedure is briefly outlined in the below figure. The method is for each variable mentioned above
- **Random error of for SLP was 1.85 ± 0.32 hPa, for DBT was 0.78 ± 0.13 ^{0} C, for DPT was 1.72 ± 0.28 ^{0} C, for SST was 1.15 ± 0.2 ^{0} C**

Pairs of simultaneous observations are made.(simultaneous : observed within the same hour)

↓

The above pairs are separated based on the distance between them (50,100,150,200,250,300 km) apart

↓

The separating distance and the average of squared difference within each pairis linearly regressed "y=mx+c". (y : variance between observations within pair; x : separating distance)

↓

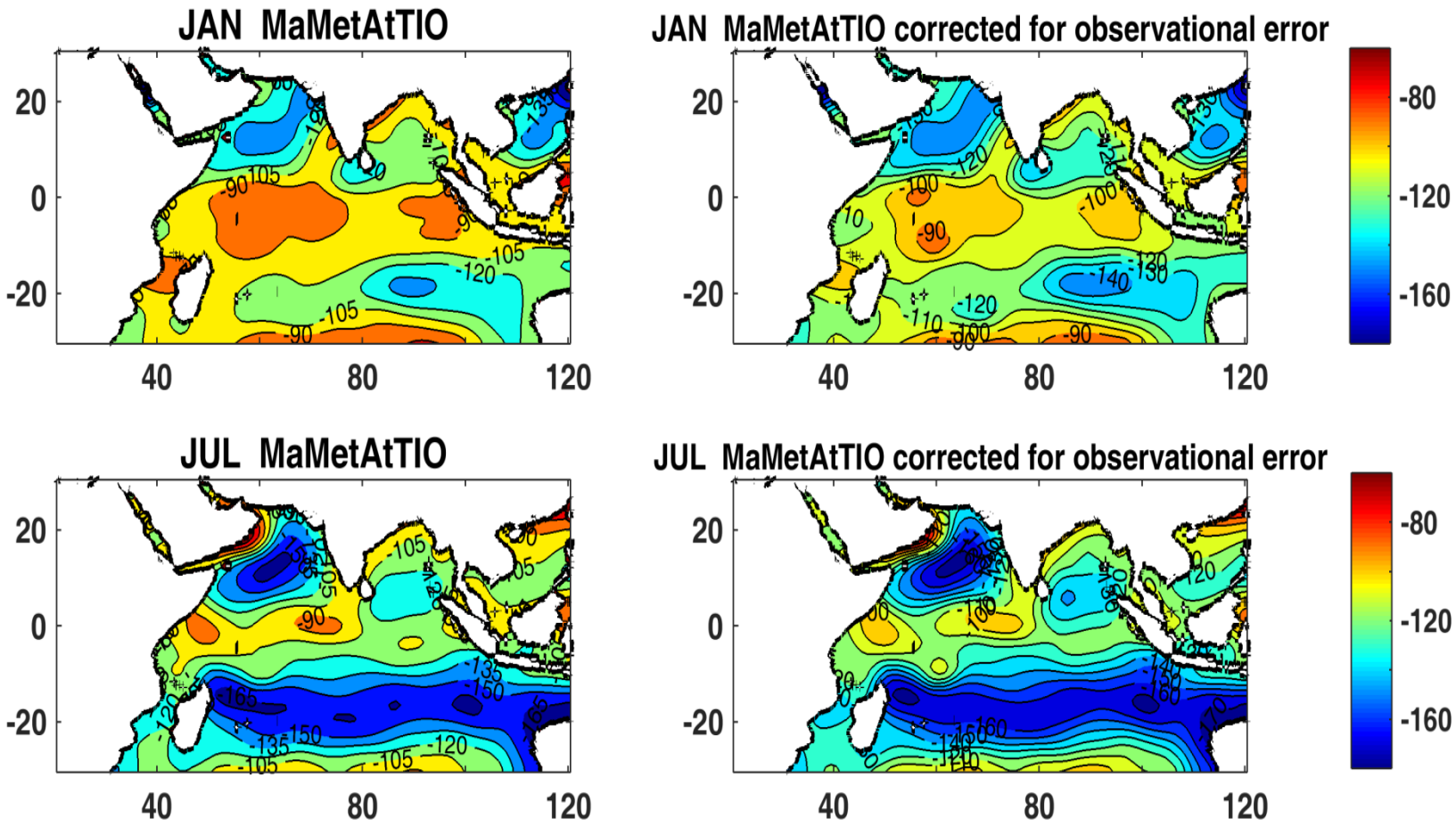
Substitute x=0, to find the variance in the observations with zero distance(x=0) apart.

↓

The resultant Y/2 is the random error in the observations

Latent Heat Flux (W/m^2)

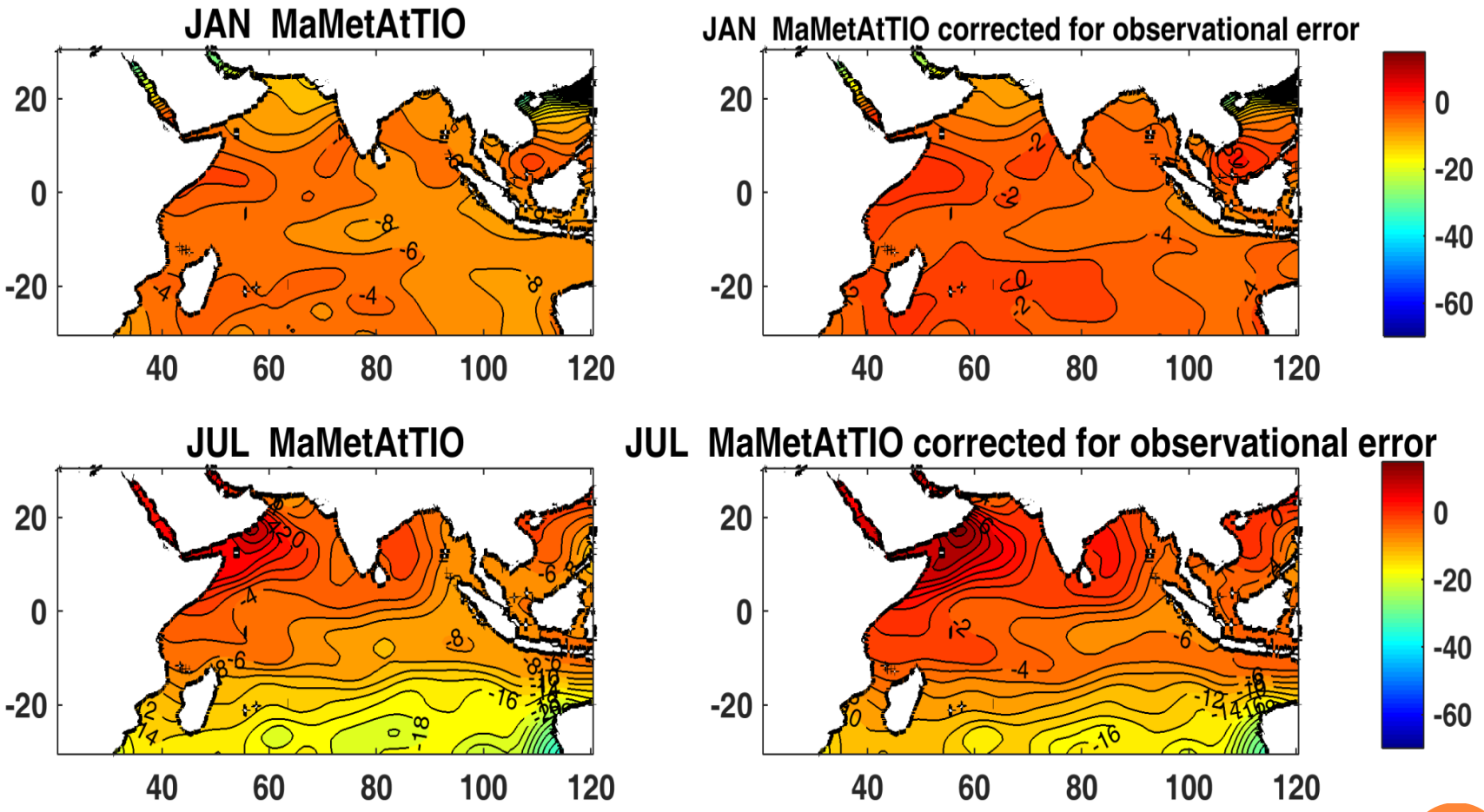
- **LHFX showed an increase of upto 20 W/m^2**



Negative sign for fluxes leaving the ocean surface

Sensible Heat Flux (W/m^2)

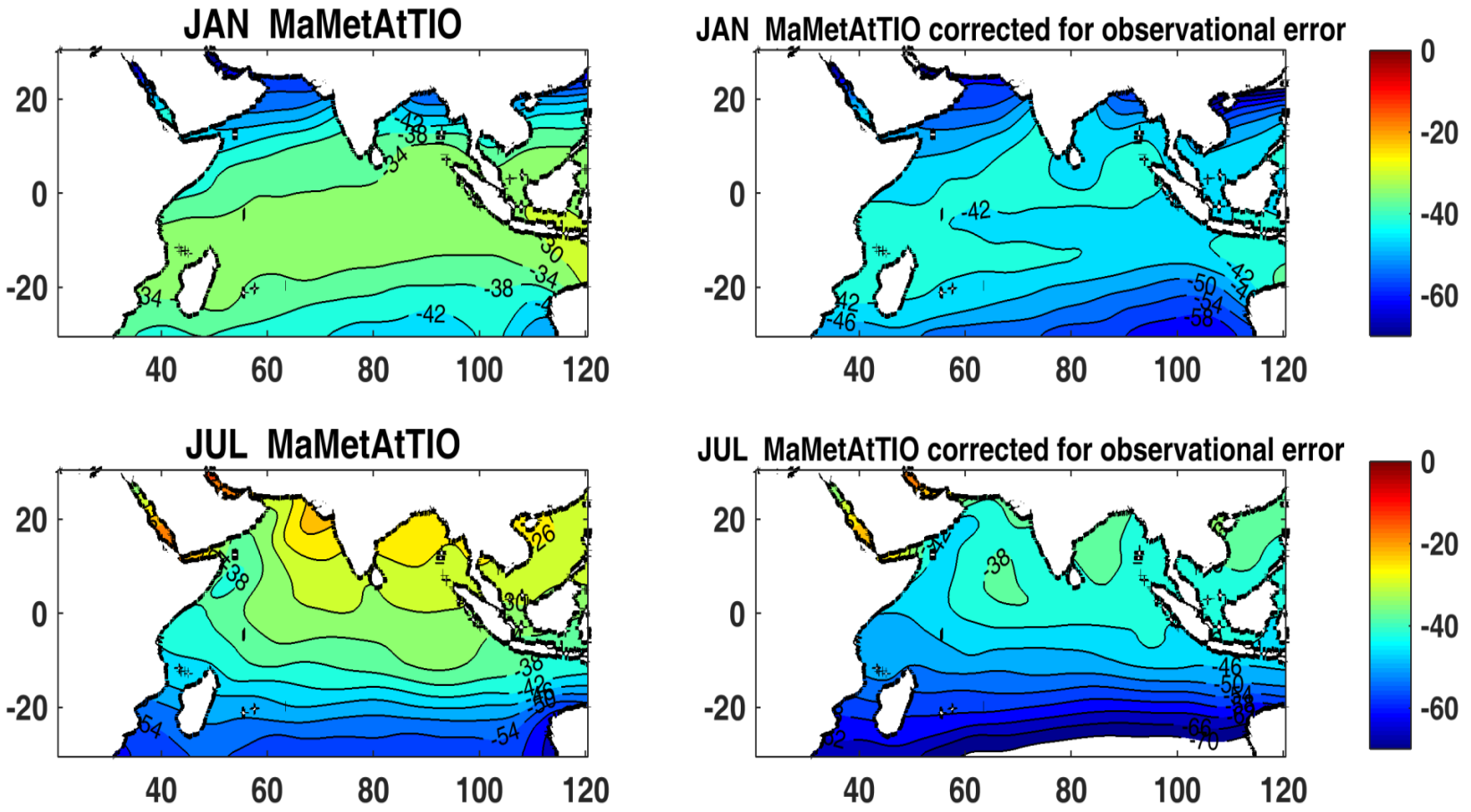
- **SHFX showed a decrease at around 2 to 4 W/m^2**



Negative sign for fluxes leaving the ocean surface

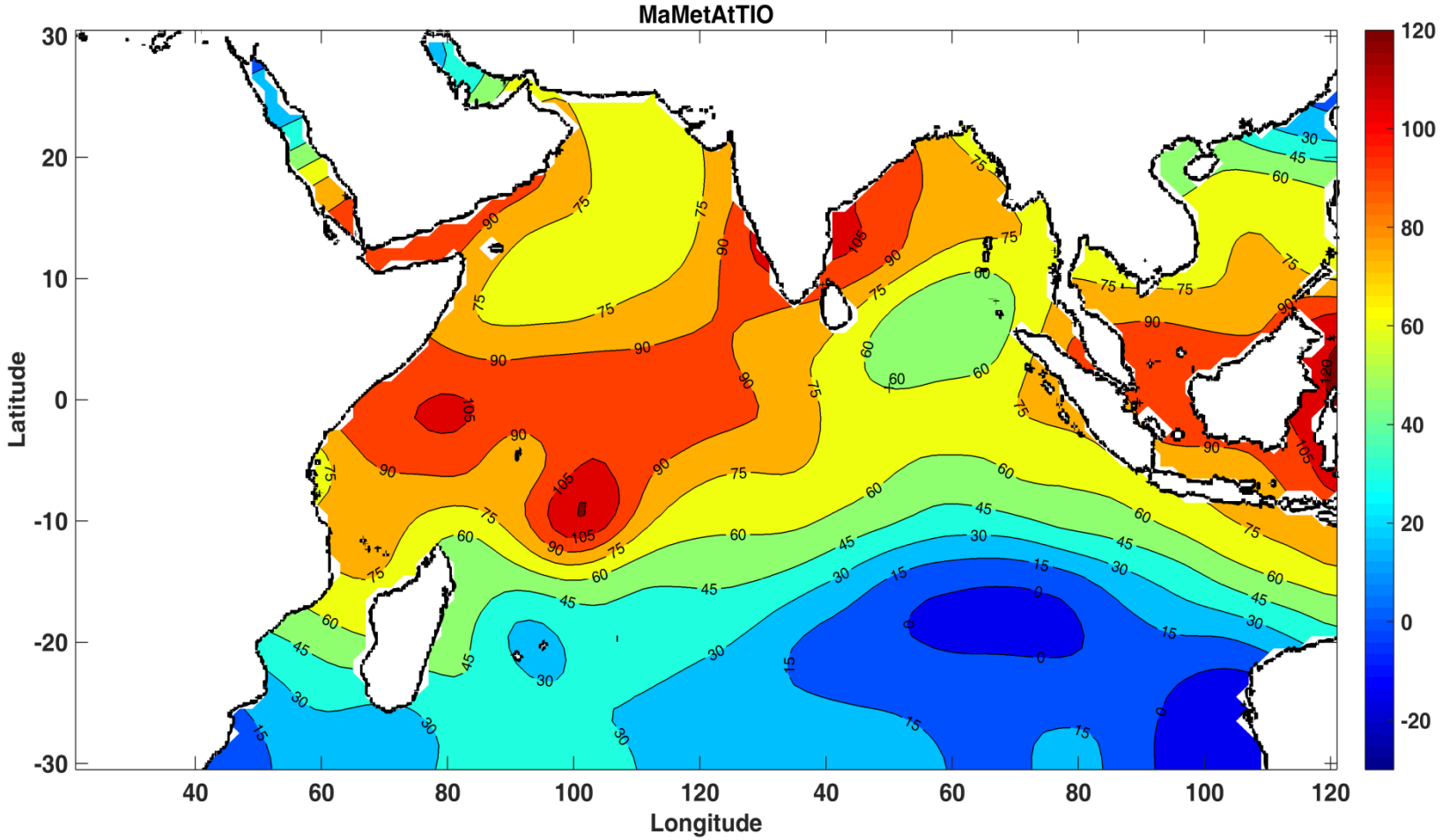
LONGWAVE RADIATION(W/M^2)

- **LWR showed an increase of upto 10 W/m^2**



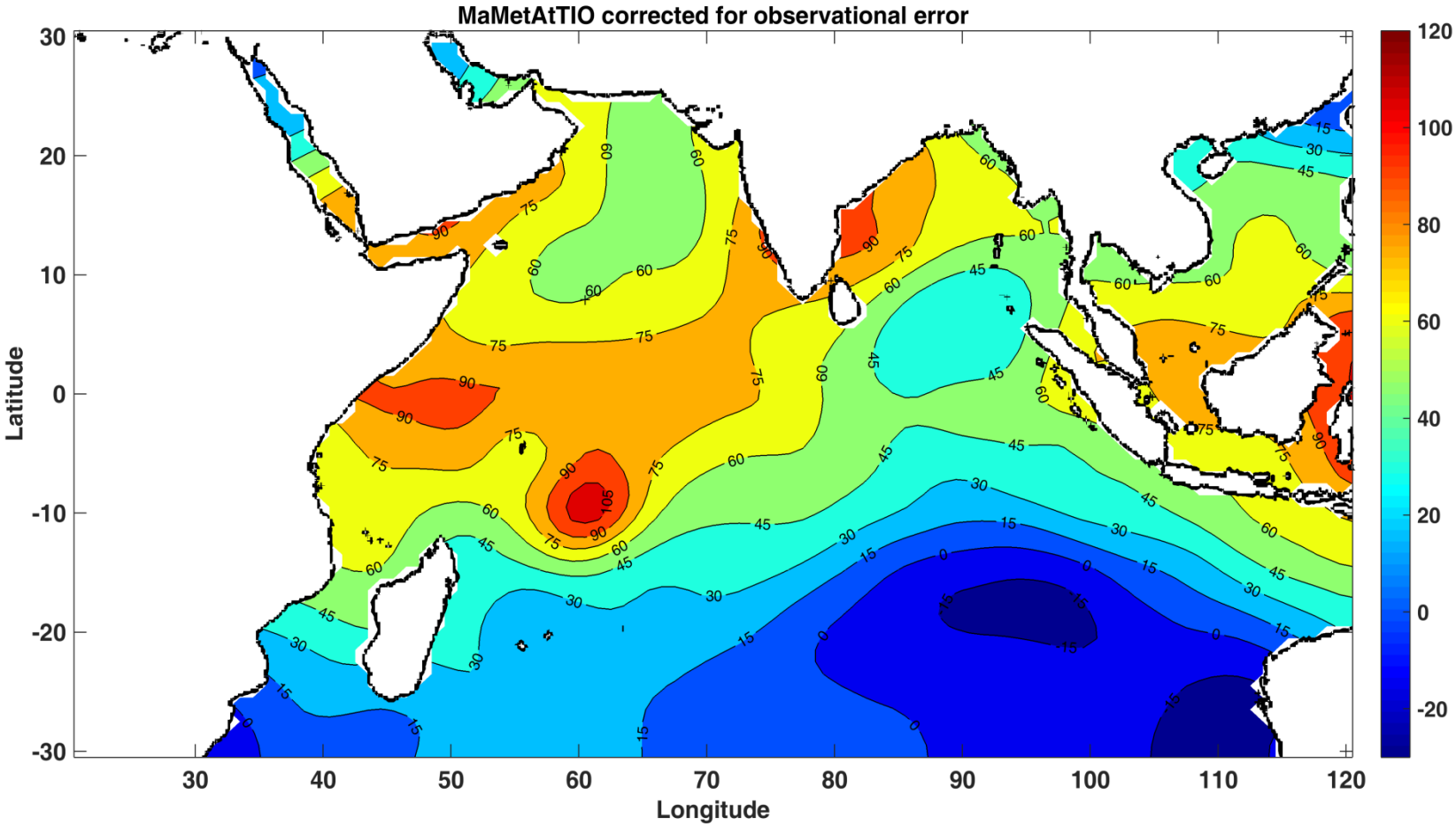
Negative sign for fluxes leaving the ocean surface

ANNUAL NET HEAT FLUX (W/m²) (BEFORE CORRECTION)



Negative sign for fluxes leaving the ocean surface

ANNUAL NET HEAT FLUX (W/m^2) (AFTER CORRECTION)



Negative sign for fluxes leaving the ocean surface