Simulation of Tsunami inundation by ComMIT Model: Bangladesh Perspective

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UNESCO-IOC Training Course on Tsunami Numerical Modeling Course II – Tsunami Inundation Modeling
Bangkok, Thailand: 29 June – 06 July, 2007

Position of Bangladesh in the Asia Map

BANGLADESH

Bangladesh is a plain deltaic land extending from 20°45' to 26°40'N and from 88°05' to 92°40'E in South Asia having area of about 148,875 sq. km under South Asian Association for Regional Cooperataion (SAARC). It has hills in the south-eastern, and north-eastern parts.

The vast Bay of Bengal lies to the south and great Himalayas to the north of the country.

It is a land of crisscross rivers. There are 230 rivers out of which 57 rivers originate from outside. The major rivers are the Meghna, the Ganges (Padma) and the Brahmaputra. All the rivers ultimaley flow to the Bay of Bengal.

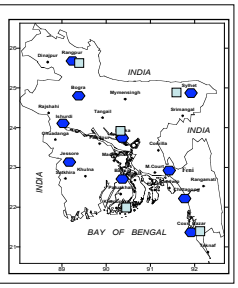
- Bangladesh is the most disaster prone country in the world with a lot of opportunities.
- Most of these disasters are meteorological and hydrological in nature. Seismological disaster is also mention worthy.
  - ◊ Cyclone & associated Storm Surge
  - ◊ Nor' westers/Tornadoes
  - ◊ Drought
  - ◊ River Erosion
  - ◊ Heat Waves and Cold Waves
  - ◊ Land slide

◇ **Earthquakes and Tsunami**

OBSERVATORIES OF BMD

- 35 FIRST CLASS OBSY.
- 4 radar stations+1 proposed
- 10 PBO

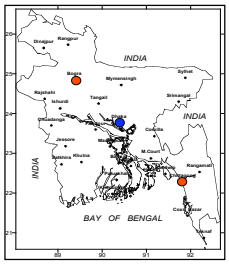
The meteorological data transmitted globally through Global Telecommunication System (GTS)



3 RAWINSONDE OBSERVATORIES

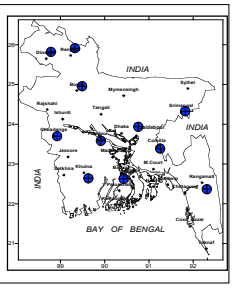
LEGEND

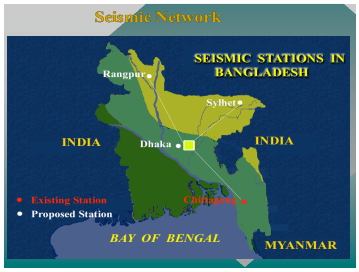
- OPERATIONAL STATION
- IRREGULAR STATIONS



11 AGRO-METEOROLOGICAL OBSERVATORIES

- OPERATIONAL AGROMETEOROLOGICAL STATION

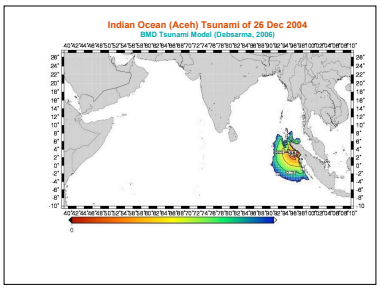


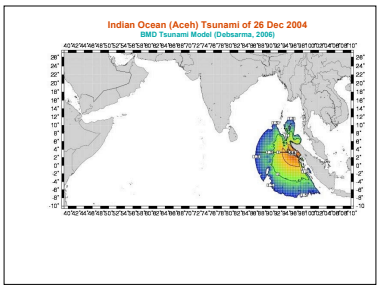


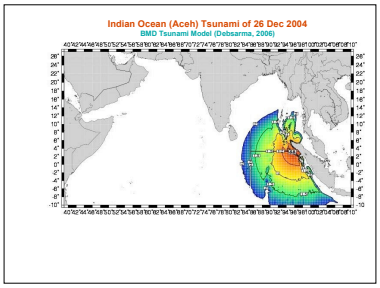
The need for Tsunami Early Warning System in Bangladesh

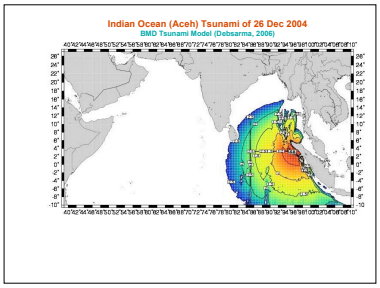
After the occurrence of the Aceh Tsunami on 26 December, 2004 the Government of Bangladesh and the people became concerned about of how to deal with the Tsunami on the backdrop of the lack of early warning system, dissemination network of warnings to the end users, preparedness and mitigation for the reduction of loss of life and property.

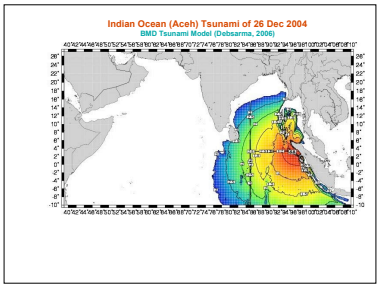
Debsarma (Feb 2006) developed Linux PC-based Tsunami Propagation Model by solving Gravity Wave equation using ray tracing method.

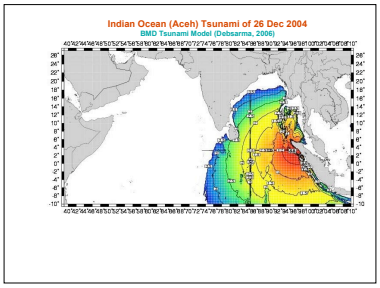


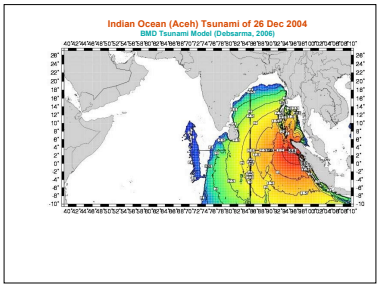


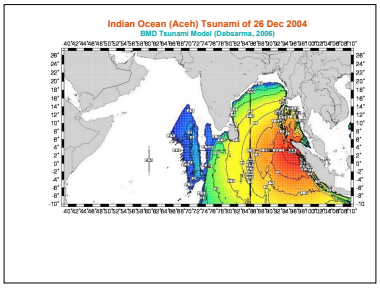


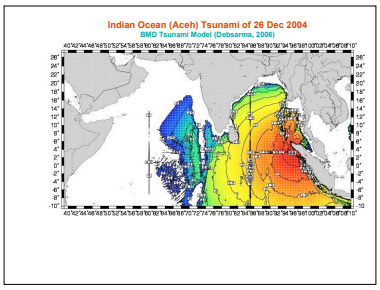


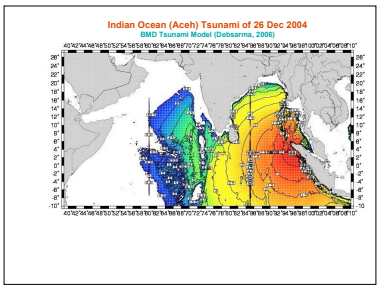









Indian Ocean (Aceh) Tsunami of 26 Dec 2004
BMD Tsunami Model (Debsarma, 2006)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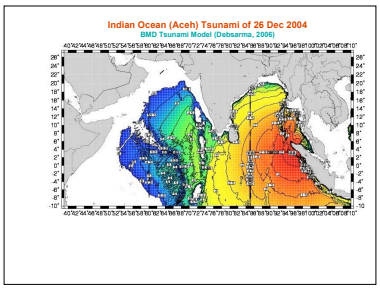
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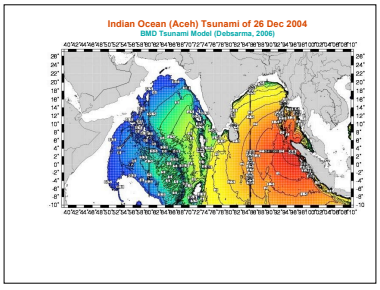
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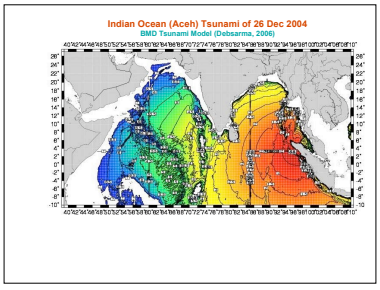
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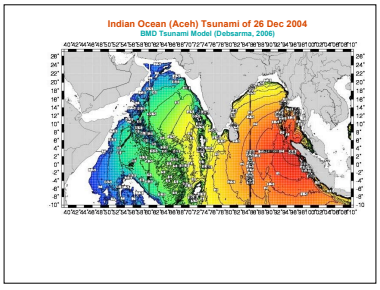
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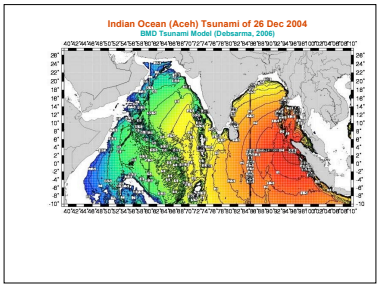
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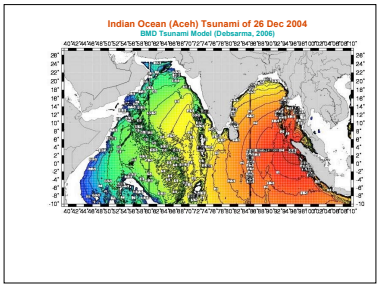
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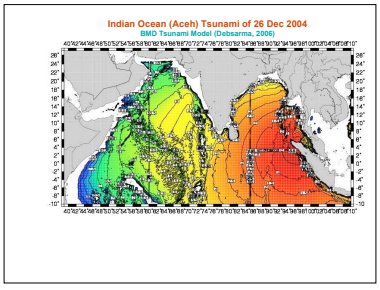
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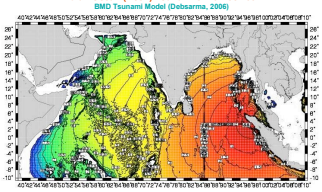
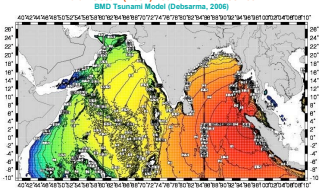
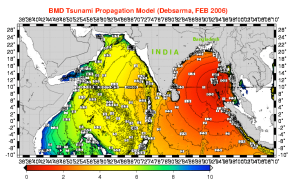
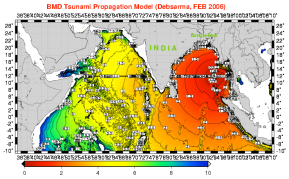


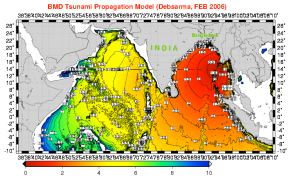




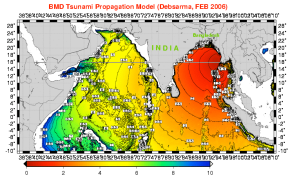
Epicentre: 10° N, 93° E, Bangladesh coast is not vulnerable, produced by BMD Tsunami Propagation Model (Debsarma, S. K., 2006)



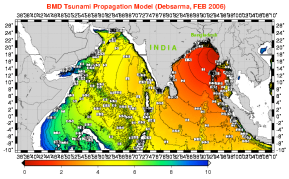
Epicentre: 12° N, 93° E, Bangladesh coast is not vulnerable produced by BMD Tsunami Propagation Model (Debsarma, S. K., 2006)



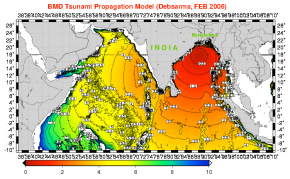
Epicentre: 14° N, 93° E, Bangladesh coast is going to be vulnerable, produced by BMD Tsunami Propagation Model (Debsarma, S. K., 2006)



Epicentre: 16° N, 93° E, Entire Bangladesh coast is vulnerable, produced by BMD Tsunami Propagation Model (Debsarma, S. K., 2006)



Epicentre: 18° N, 93° E, Entire Bangladesh coast is vulnerable, produced by BMD Tsunami Propagation Model (Debsarma, S. K., 2006)



Epicentre: 18° N, 88° E, Entire Bangladesh coast is vulnerable, produced by BMD Tsunami Propagation Model (Debsarma, S. K., 2006)

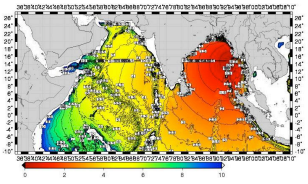
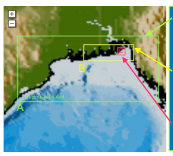


Fig. 5: Isochrone (one hour interval) Analysis of a fictitious Tsunami centred at latitude 15°N, longitude 93°E produced by BMD Tsunami Propagation Model (Debsarma, S.K., February 2006). The whole coast of Bangladesh, east coast of India, west coast of Myanmar and Thailand are seen to be affected.

Experiment with ComMIT Model

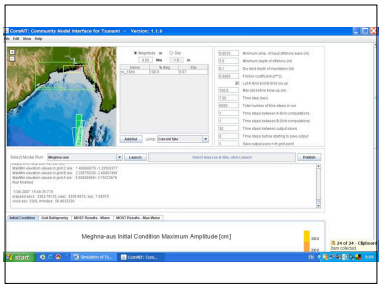


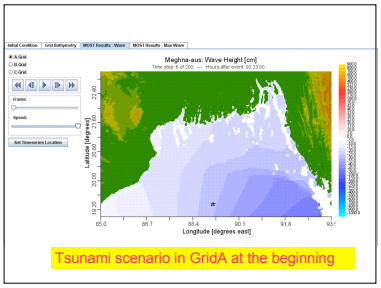
GridA: Lat 19.0^0 – 23.0^0 N
Lon 85.0^0 – 93.50E

GridB: Lat 21.5^0 – 22.5^0 N
Lon 89.00 – 92.00E

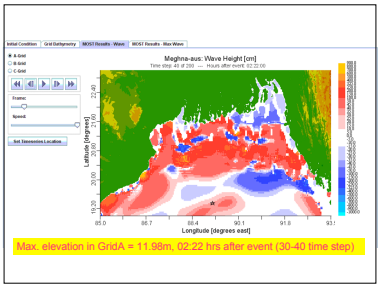
GridC: Lat 21.8^0 – 22.3^0 N
Lon 91.0^0 – 91.5^{0}E

Nested Grids A, B & C

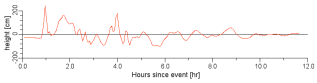




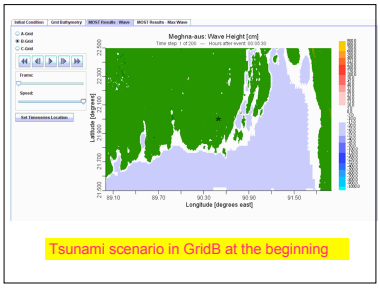
Tsunami scenario in GridA at the beginning



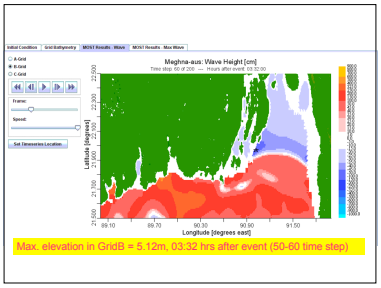
Max. elevation in GridA = 11.98m, 02:22 hrs after event (30-40 time step)



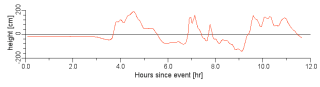
Time series of Tsunami wave height



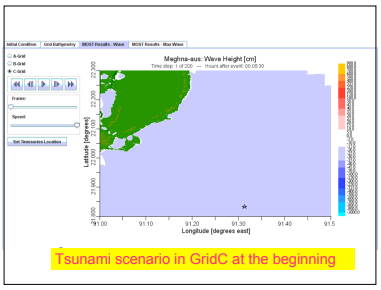
Tsunami scenario in GridB at the beginning



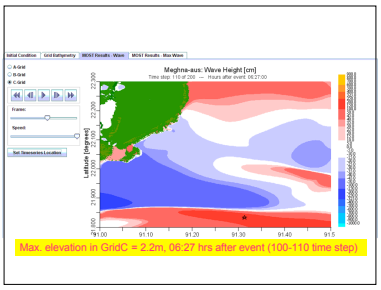
Max. elevation in GridB = 5.12m, 03:32 hrs after event (50-60 time step)



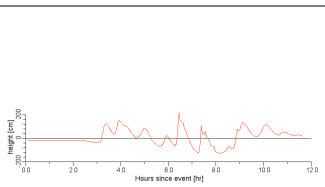
Time series of Tsunami wave height
(south of Bhola)



Tsunami scenario in GridC at the beginning



Max. elevation in GridC = 2.2m, 06:27 hrs after event (100-110 time step)



Time series of Tsunami wave height
(Meghna Estuary)

Tsunami Information Bulletin: In case of the Java Tsunami of 17 July 2006, the Tsunami Information Bulletin (based on JMA Bulletin) issued by BMD is given below:

Government of the People's Republic of Bangladesh
Bangladesh Meteorological Department
Storm warning Centre
Agargaon, Dhaka-1207

Phone: 8113071
FAX: 8159230
E-mail: swcbmd@yahoo.com
Date:17-07-2006

TSUNAMI INFORMATION BULLETIN
WECNG IUTO 17TH/0
TSUNAMI BULLETIN NUMBER 022 ISSUED BY THE JAPAN METCOROLOGICAL AGENCY (JMA) ISSUED AT 1143
17 JUL 2006 (UTC) / 1743 LOCAL TIME / 1743 BMD WHICH IS IN EFFECT
1. EARTHQUAKE INFORMATION ORIGIN TIME : 0819 17 JUL 2006 (UTC)
COORDINATES : 9.3 SOUTH 107.3 EAST LOCATION : SOUTH OF JAWA, INDONESIA MAGNITUDE : 7.2
1. EVALUATION THERE IS A POSSIBILITY OF A DESTRUCTIVE LOCAL TSUNAMI IN THE INDIAN OCEAN.
2. ESTIMATED TSUNAMI TRAVEL TIME ONE HOUR OR LESS
INDONESIA:
INDIAN OCEAN COAST OF SUMATRA
INDIAN OCEAN COAST OF JAWA
SOUTH COASTS OF LESSER SUNDA ISLANDS
AUSTRALIA: COCOS ISLANDS
OBSERVASIONS ON MAXIMUM TSUNAMI WAVE

LOCATION	COORDINATES	ARRIVAL	TIME	AMPL
BENGKULU	8.8S 115.3E	19442	17 JUL	0.2M

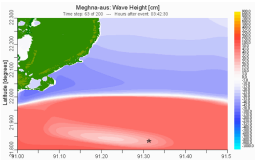
AMPL – AMPLITUDE IN METERS OF HALF OF THE CREST TO TROUGH

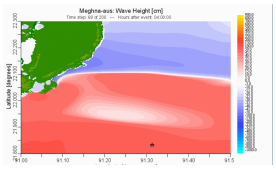
*TSUNAMI TRAVEL TIME IS ESTIMATED ONLY FROM EARTHQUAKE DATA AND INDICATES THE TIME LAPSE BETWEEN ORIGIN TIME AND TSUNAMI ARRIVAL TIME.
*THIS WILL BE THE FINAL INFORMATION UNLESS THERE ARE CHANGES ABOUT THE POTENTIAL OF TSUNAMI GENERATION AND ESTIMATED TSUNAMI TRAVEL TIME BY RE-EVALUATION OF THE EARTHQUAKE OR THERE ARE REPORTS ON TSUNAMI OBSERVATIONS.

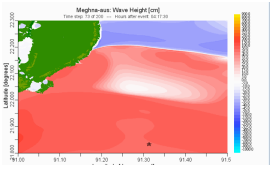
SD/-
D u t y
Forecasting Officer (DFO)
For Director

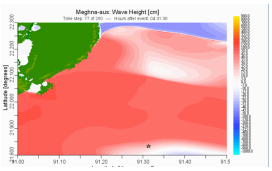
Miles to GO .....

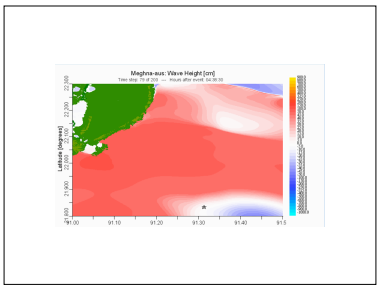
- High resolution data in and around the Head of the Bay of Bengal under Bangladesh territory need to be incorporated.
- DART or equivalent Buoy has to be employed in the Bay of Bengal.
- Validation need to be done for Bangladesh coast.
- Training would be imparted to BMD and other concerned officials.
- Holding of national and regional Seminar on Tsunami modeling would be proposed.

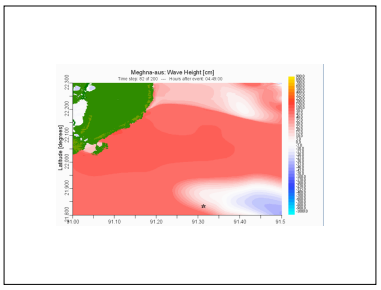









Meghna-aus: Wave Height [cm]
Latitude (degree)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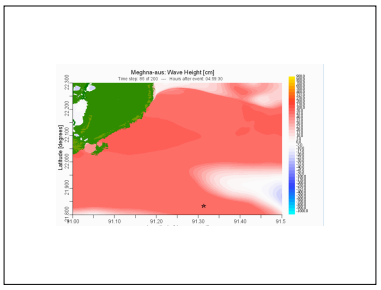
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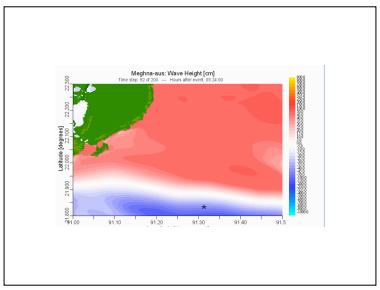
Latitude (degree)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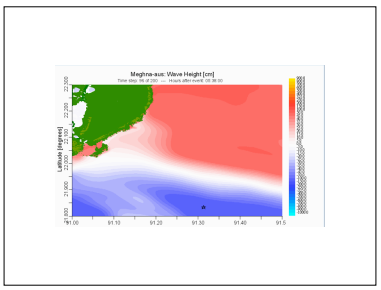
Latitude (degree)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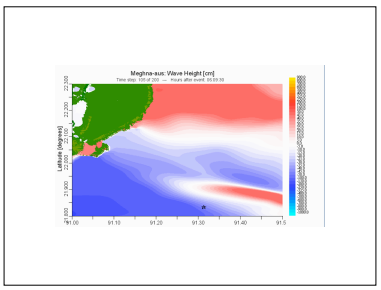
Latitude (degree)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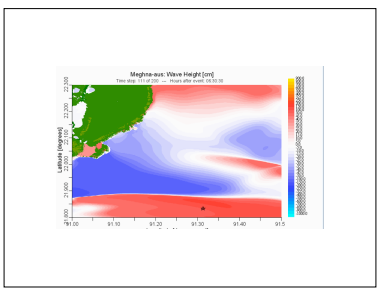
Latitude (degree)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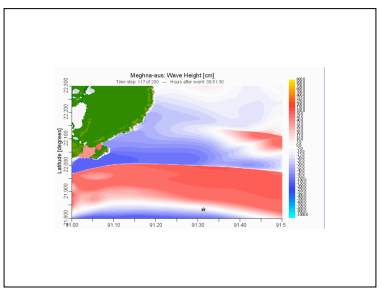
Latitude (degree)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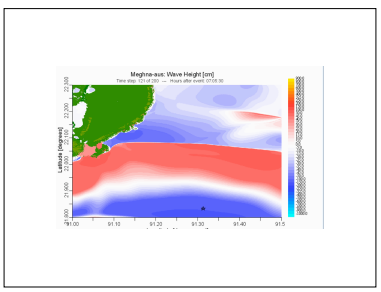
Latitude (degree)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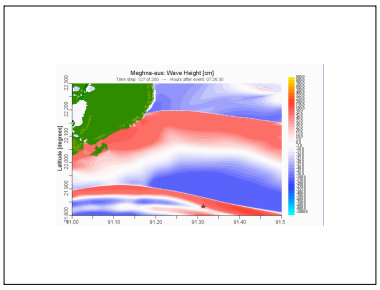
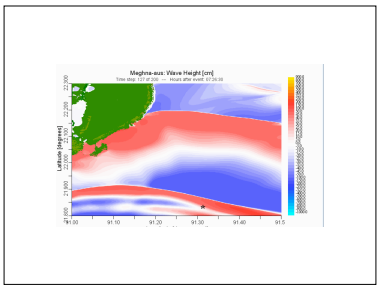
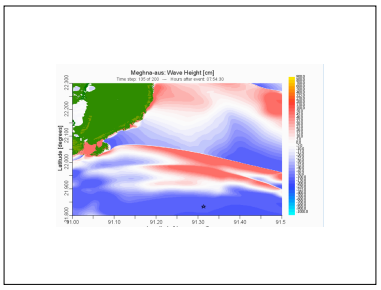
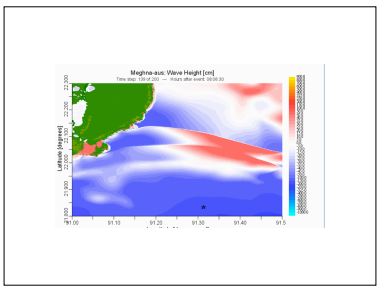
Latitude (degree)


Meghna-aus: Wave Height [cm]
Latitude [degree]


Meghna-aus: Wave Height [cm]
Latitude [degree]


Meghna-aus: Wave Height [cm]
Latitude [degree]


Meghna-aus: Wave Height [cm]
Latitude [degree]

THANK YOU ALL