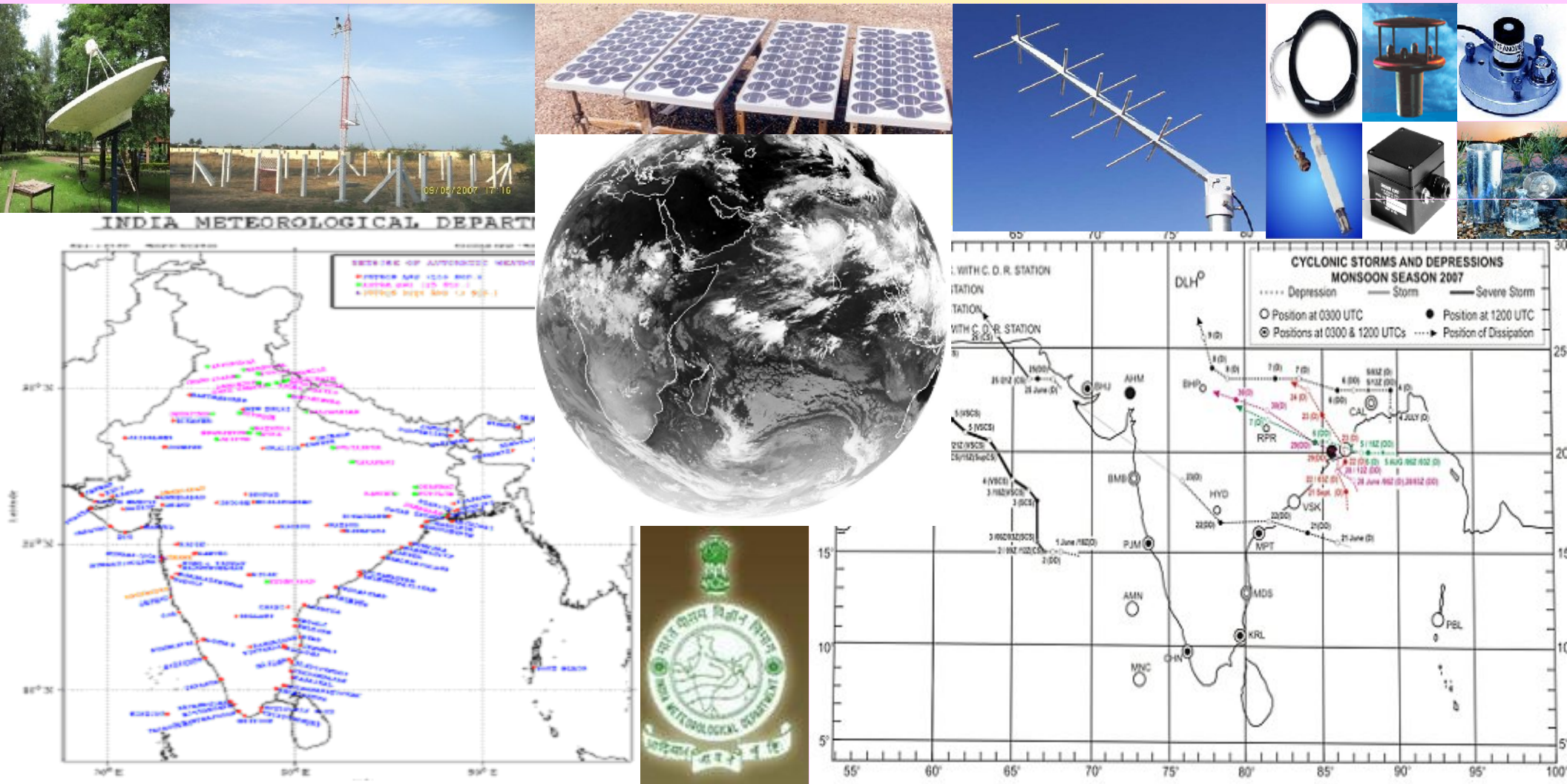


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Performance evaluation of the upgraded IMD network of Automatic Weather Stations during depressions of Indian Summer Monsoon 2007

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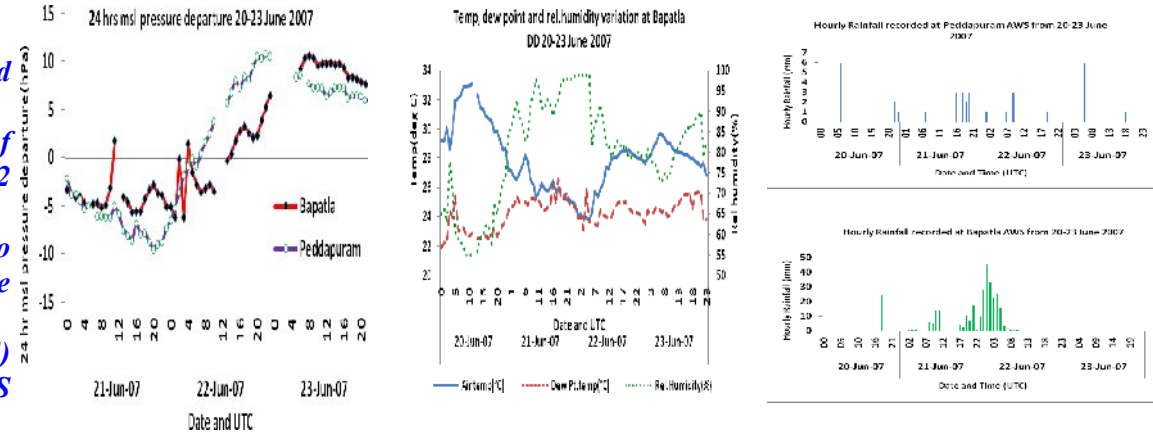


Performance evaluation of the upgraded IMD network of Automatic Weather Stations during depressions of Indian Summer Monsoon 2007

- ❏ *Installation and commissioning of upgraded IMD network of 125 Automatic Weather Stations(AWS) was completed during 2006-07. AWS utilise the geostationary satellite Kalpana-1 for telemetry link and Pseudo-random burst sequence for hourly transmissions through satellite.*
- ❏ *June-Sep 2007 was the first monsoon period in India having a reliable and full-fledged AWS network utilizing satellite based communication as an additional observational technique for forecasters. During SWM 2007, five synoptic systems formed in the north Bay of Bengal out of which four were deep depressions and one was a depression.*
- ❏ *Climatologically, two monsoon depressions occur during the SW Monsoon season in north Bay of Bengal giving good rainfall along the east coast.*
- ❏ *Coastal States of India along the east coast like Orissa, West Bengal, Andhra Pradesh received good rainfall due to the passage of these systems. Crucial hourly data was received from AWS sites where conventional observatories are not located.*
- ❏ *The following five synoptic systems which formed in the Bay of Bengal, during the south west monsoon season, 2007 have been taken for the study.*
 - ⊙ *Deep depression of 21-23 June 2007*
 - ⊙ *Deep depression of 28-30 June 2007*
 - ⊙ *Deep depression of 5-7 Aug 2007*
 - ⊙ *Deep depression of 4-9 July 2007*
 - ⊙ *Depression of 21-24 Sep 2007*
- ❏ *Hourly data of AWS located along the track of the deep depressions has been utilized and the variations in mean sea level pressure, 24 hour pressure fall, and rainfall before, during and after the passage of the synoptic systems have been analysed and graphically presented.*
- ❏ *Pin-pointing the exact landfall of the systems was possible with the data of AWS along the coast.*
- ❏ *Challenges in maintaining a vast AWS network and keeping the downtime to a minimum are also addressed.*

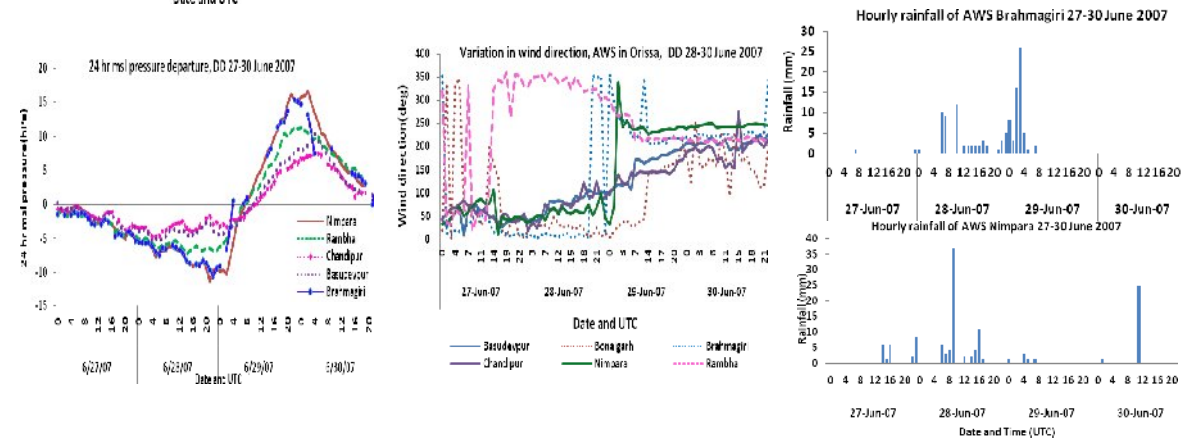
Case 1: Deep depression of 21-23 June 2007

- The synoptic system initially originated at 15.5°N / 86°E and then became a deep depression on 22nd June.
- Bapatla(15°54'N/80°28'E) and Darsi(15°46'N/79°34'E) (SW of Kakinada) received a very heavy rainfall of 215 mm and 152 mm on 22nd June respectively due to the passage of the system.
- AWS Peddapuram (17°04'N/82°09'E) which is located close to Kakinada observatory, reported a 24 hour msl pressure departure of 9.5 hPa (20-21 June 2007, 20 UTC)
- The system crossed coast near Kakinada (16°57' N/ 82°14' E) on 21st June as per conventional observatory data. As per AWS data the system crossed near Peddapuram.



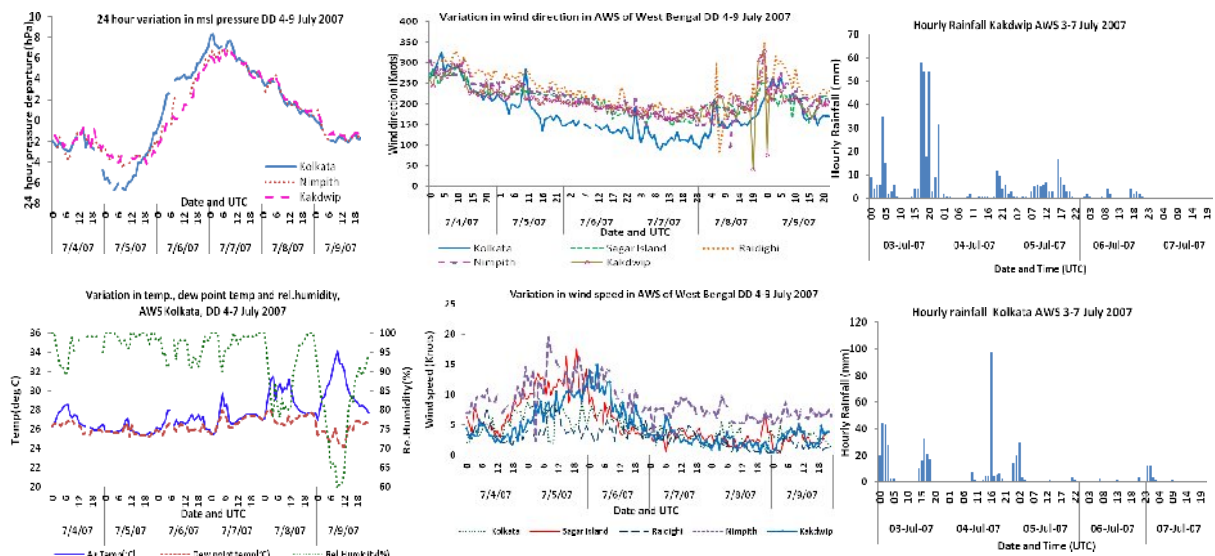
Case 2 : Deep depression of 28-30 June 2007

- The second depression of June formed over the northwest Bay of Bengal and adjoining central Bay on 28th near Lat.18.5°N/Long 87°E (about 200km southeast of Puri).
- The system crossed coast near Puri (19°48' N/ 85°49' E) between 00 and 0100 hrs UTC of 29th, as per conventional observatory data.
- As per data of AWS in the Orissa coast, system crossed the coast near Brahmagiri (19°48'N/85°40'E) and Nimpara (20°03'N/86°06'E) at about 22 UTC with 24 hr pressure fall of 11.3 hPa and 10.6 hPa respectively.



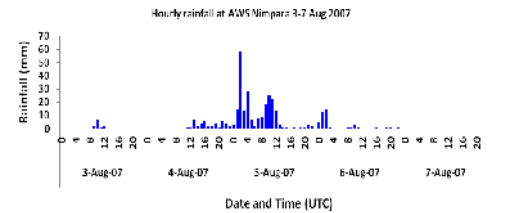
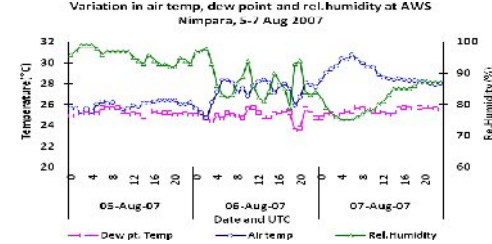
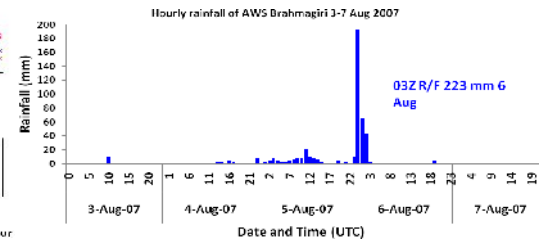
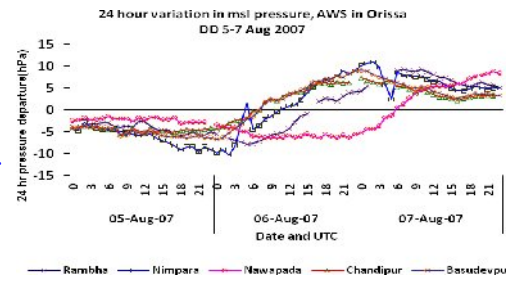
Case 3 : Deep depression of 4-9 July 2007

- During July, a deep depression formed over the north Bay of Bengal near the Bangladesh coast (about 150 kms southeast of Kolkata) on 4th.
- It intensified into a deep depression on the same day and the system had land-fall at 22°N/89.5°E on 4th July around 03 UTC near AWS Nimpith (22°10'/88°27') and Canning(22°15'N/88°40'E).
- Six AWS located in West Bengal around 21-24°N latitude/88-86°E longitude have shown fall in pressure during the movement of the deep depression inland. The 24 hour variation in pressure for AWS at Kolkata, Nimpith and Kakdwip showed a fall of 6.7, 4.6 and 4.2 hPa respectively on 5th July 09 UTC, 08 UTC, 19 UTC respectively.
- Heavy rainfall occurred many stations over West Bengal. Maximum rainfall of 30.9 cm occurred in 24 hours in Kakdwip located in the SW quadrant of the depression.



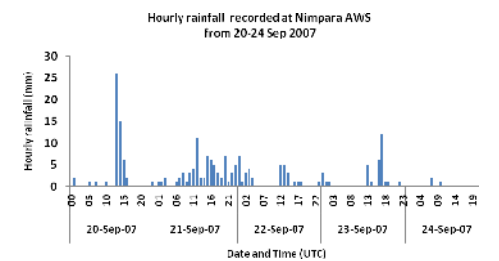
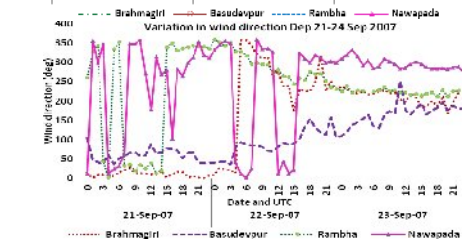
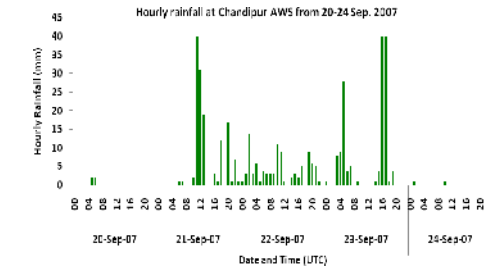
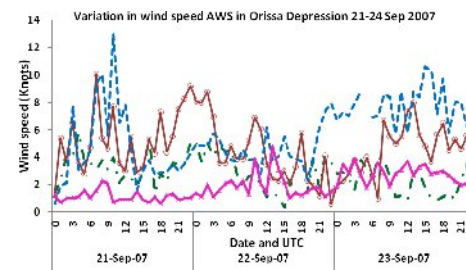
Case 4 : Deep depression of 5-7 Aug 2007

- The deep depression of 5-7 Aug 2007 originated in the west central Bay off West Bengal – Orissa coasts on 5th (about 100 kms southeast of Chandbali(20°47'N/86°44'E) and dissipated near 21.5°E / 81.5°E.
- The gradual fall in pressure from 4 Aug 2007 was noticed in AWS Rambha, Nawapada, Chandipur and Nimpara located along coastal Orissa.
- Brahmagiri recorded a very heavy rainfall of 223 mm on 6 Aug 2007.
- Data of seven AWS located in Orissa state and there is no co-located conventional observatory in these sites. Data was crucial in pinpointing the crossing at coast.



Case 5 : Depression of 21-24 Sep 2007

- During September, a depression, formed over the west central Bay off Andhra coast on 21st near Lat.18°N/Long.86.5°E about 230 kms, southeast of Puri. Moving northwestwards, it crossed the Orissa coast close to Puri (19°48'N/85°49'E) on 22nd.
- As per AWS data, the system crossed the coast near Nimpara (20°03'/86°06') on 22nd Sep. 2007 at 22 UTC. Chandipur(21°27'N/87°00'E) recorded a 24 hr rainfall of 152 mm on 22 Sep 03 Z.
- Moving northwestwards, it weakened into a wellmarked low pressure area over north Chattisgarh and adjoining east Madhya Pradesh on 24th and then into a low pressure area over east Uttar Pradesh and neighbourhood on 25th and became less marked on 26th. Rainfall pattern in the States of Andhra Pradesh and Orissa are shown in fig.



Challenges for maintenance of the AWS network

- Accurate and reliable measurements from AWS are possible only with properly calibrated sensors and periodic regular maintenance especially prior to the onset of monsoon
- Clogging of rain gauge due to leaves, twigs, fine mud deposits due to wind, bird droppings, may further lead to wrong readings. Regular upkeep of the AWS enclosure by clearing off the bushes and creepers is a must for reliable data.
- Erroneous temperature and humidity values are sometimes reported due to deposits of dust over the thermoplastic radiation shield and the inherent errors induced due to sudden insolation and calm conditions.
- Unforeseen theft of equipments like battery, solar panel and other components of an AWS leads to non-functional status of an AWS and hence loss of data.

Conclusions

- The study of all the five synoptic systems of the monsoon season 2007 indicate that accurate and reliable data from AWS can be obtained when the network is maintained well. Crucial data during adverse weather can be utilized when conventional observatories are unable to provide data at frequent intervals and when sufficient observatories are not located in a spatially representative grid square.
- Analysis of all weather parameters of the five synoptic systems indicate the same meteorological variations as is evident from the pictorial depictions.
- The analysis has proven the dependability on AWS in India as presently is the case in considerably most other countries.
- Many other challenges still remain but efforts are being made to overcome the problem areas and identify solutions for them as modernization is inevitable in the changing technological scenario.