



*Disaster Management Associated  
with Kelani River*

*Eng.K. Sivapalasundaram,  
Sri Lanka – Irrigation Department  
11<sup>th</sup> March 2016*



## ***Objectives of Disaster Mitigation***

- Minimizing the live losses.
- Minimizing the property damages.
- Minimizing the economic losses.
- Minimizing the crops damages.
- Minimizing Expenditure to Govt.

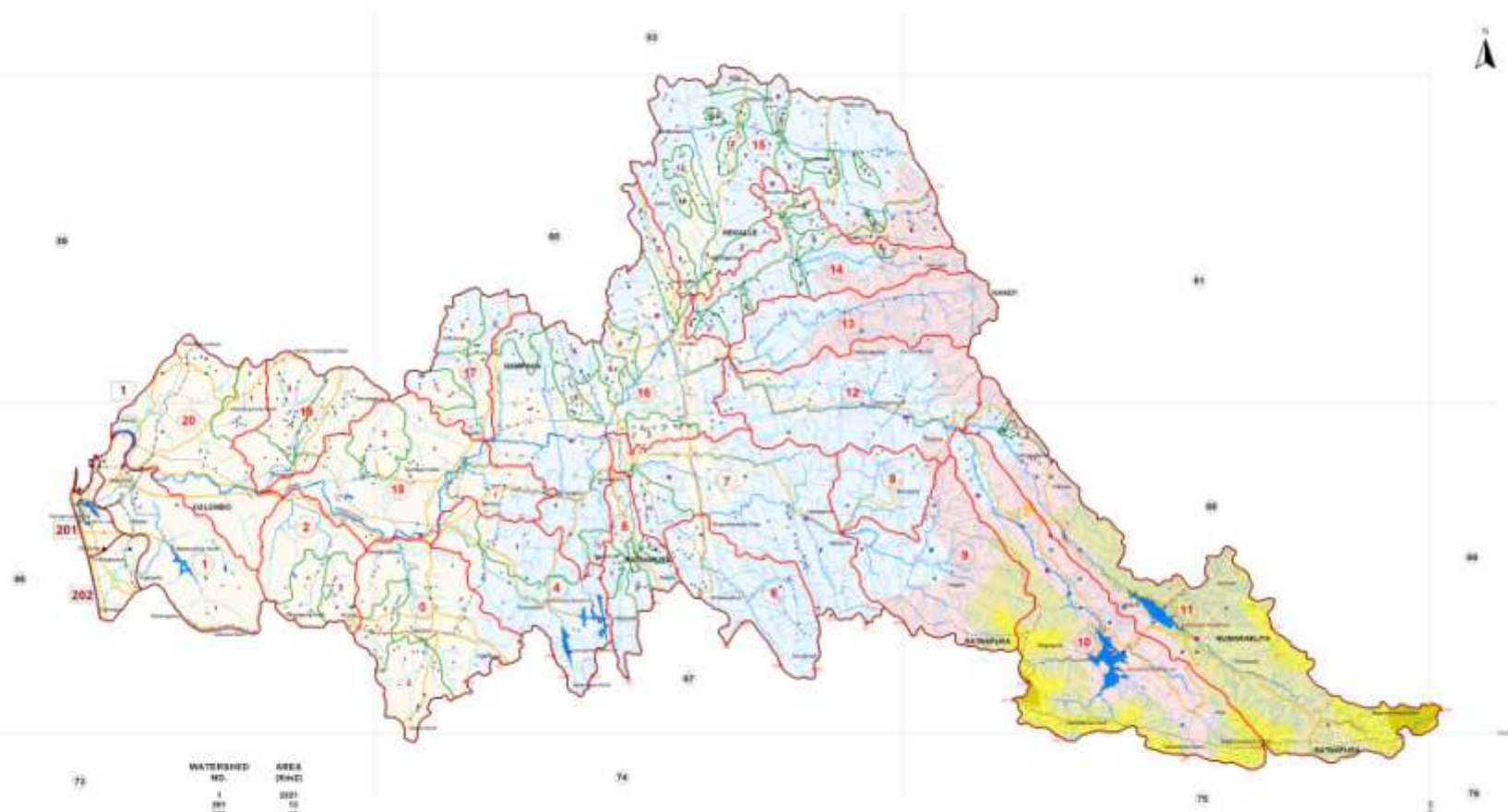
# Asia







**SUB WATERSHEDS, VILLAGE TANK CASCADES (ELLANGAWA) & ANICUT CLUSTERS OF KELANI GANGA, BEIRE LAKE & KIRULAPANA  
MAJOR & MINI WATERSHEDS  
( WS NO. 1, 201, 202 )**



WATERSHED NO.	AREA (KM <sup>2</sup> )
1	321
201	12
202	10

- 201 Watershed Number
- 1 Sub Watershed Number
- 2 Village Tank Cascade Number
- 3 Village Tank Anicut Cascade Number
- 4 Village Anicut Tank Cluster Number
- 5 Village Anicut Cluster Number
- 6 Elevation Value in Meters (MSL)
- 7 Agro Meteorological Stations
- 8 Tank/Reservoir/Lagoon/Kalapu Name

- 9 District Name
- 10 Place Name
- 11 Rain Gauge Stations (Daily) by Met Department
- 12 Rain Gauge Stations (Daily) by Others
- 13 Mountain Peaks
- 14 Pan Evaporation Stations
- 15 Hydro-metric Stations
- 16 Village Anicuts

- 17 District Boundary
- 18 Main Road
- 19 Railway
- 20 Natural Waterways
- 21 Irrigation Canal

- 22 Major & Mini Watershed Boundary
- 23 Sub Watershed Boundary
- 24 Cascade Boundary
- 25 1:50,000 Map Index

- 26 Tank / Reservoir / Lake / Kalapu / Lagoon
- 27 Tank Abandoned
- 28 Waterside
- 29 Pond

**ELEVATION CLASS (m)**

< 100
100 - 500
500 - 1000
1000 - 1500
1500 - 2000
> 2000

# Annual Rainfall

Varies between  
under 1000 mm to  
over 5000 mm

Higher values in the  
western slopes of the Hill  
Country

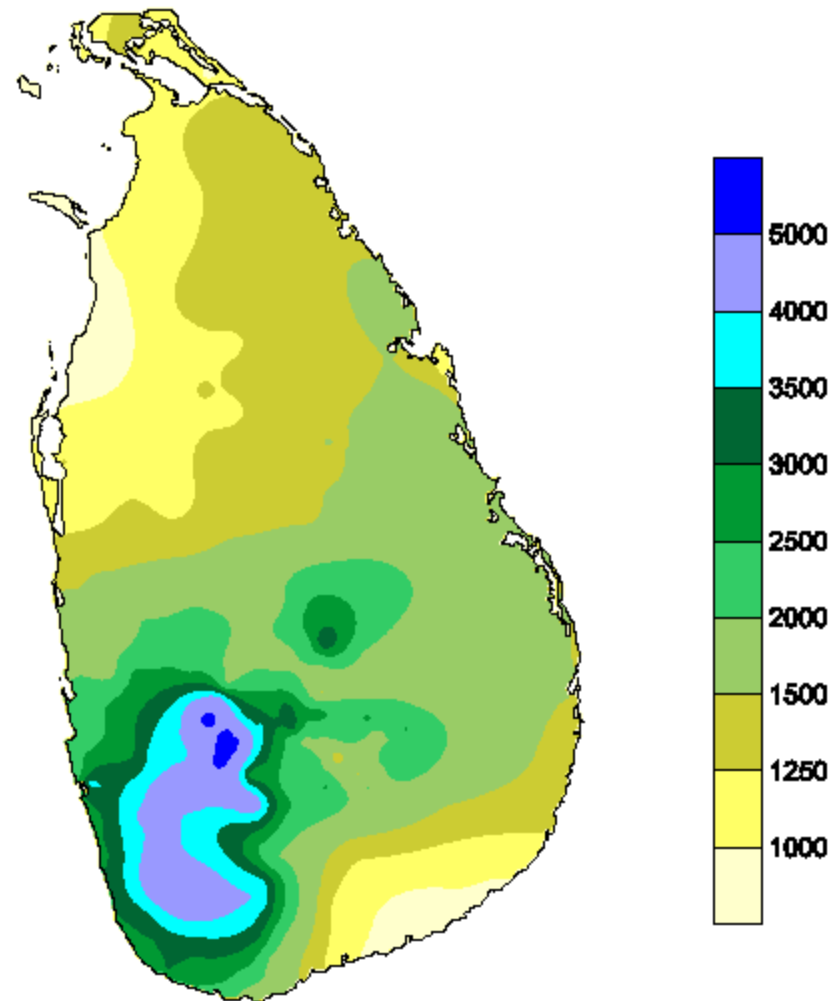
and

Lower values in the  
Southeastern and  
Northwestern coastal

areas.

**Average Annual Rainfall of 1861.0 mm**

**Equivalent to 122 km<sup>3</sup>**



# 2014 December Rainfall (mm)

	District	Dec (19 <sup>th</sup> to 21 <sup>st</sup> )	Dec (24 <sup>th</sup> to 26 <sup>th</sup> )
1	Ampara	307	374
2	Batticaloa	356	262
3	Trincomalee	420	162
4	A'pura	375	205
5	Polonnaruwa	514	254
6	Matale	238	431
7	Kandy	220	284
8	Nuwereliya	96	154
9	Kurunagala	186	312



# % of 2014 December Rainfall Vs Long term Monthly Average

	District	Dec ' 2014
1	Ampara	200 %
2	Batticaloa	218 %
3	Trincomalee	306 %
4	A'pura	328 %
5	Polonnaruwa	306 %
6	Matale	480 %
7	Kandy	288 %

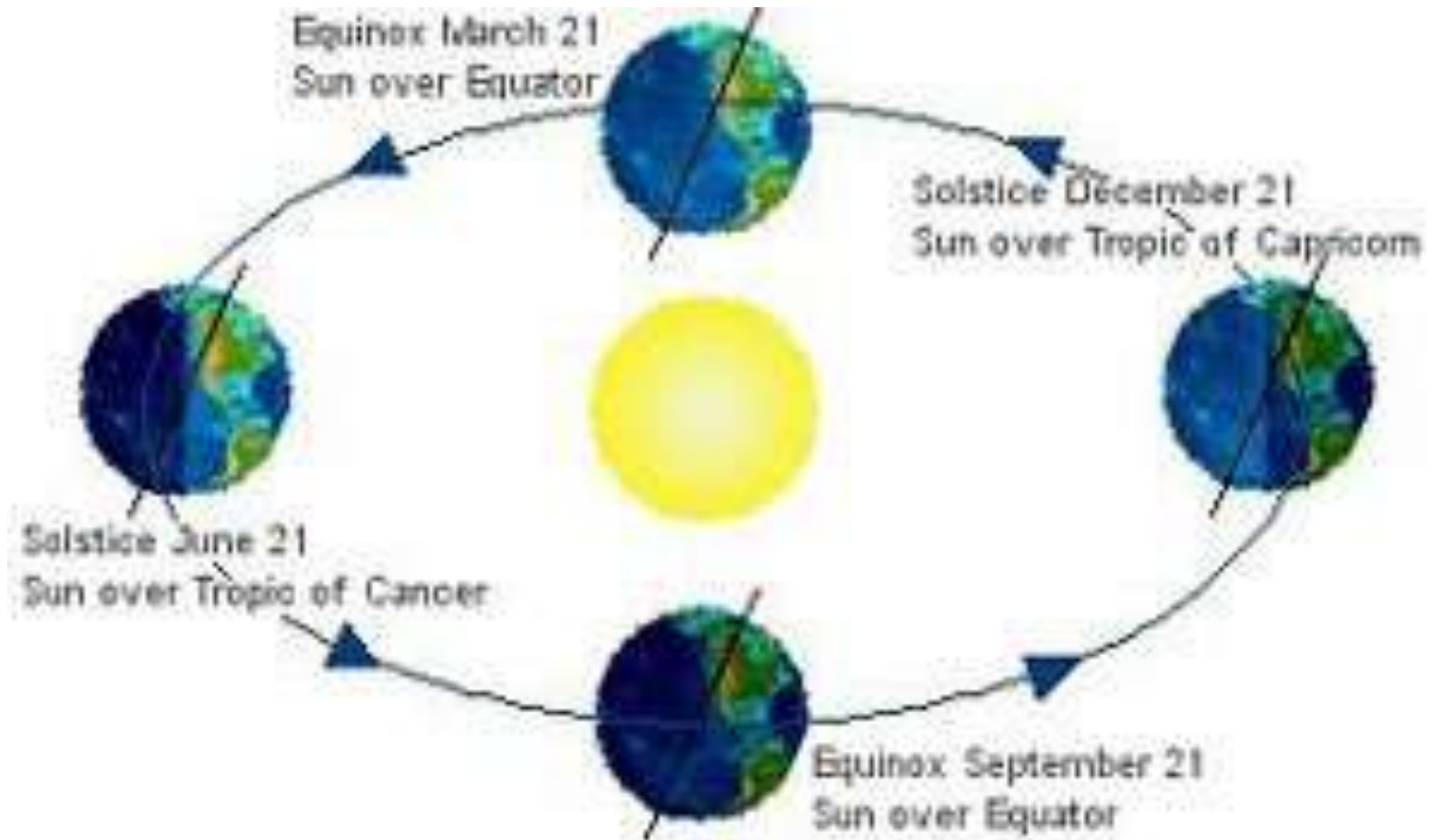
# Major Floods in Many Rivers Dec'14

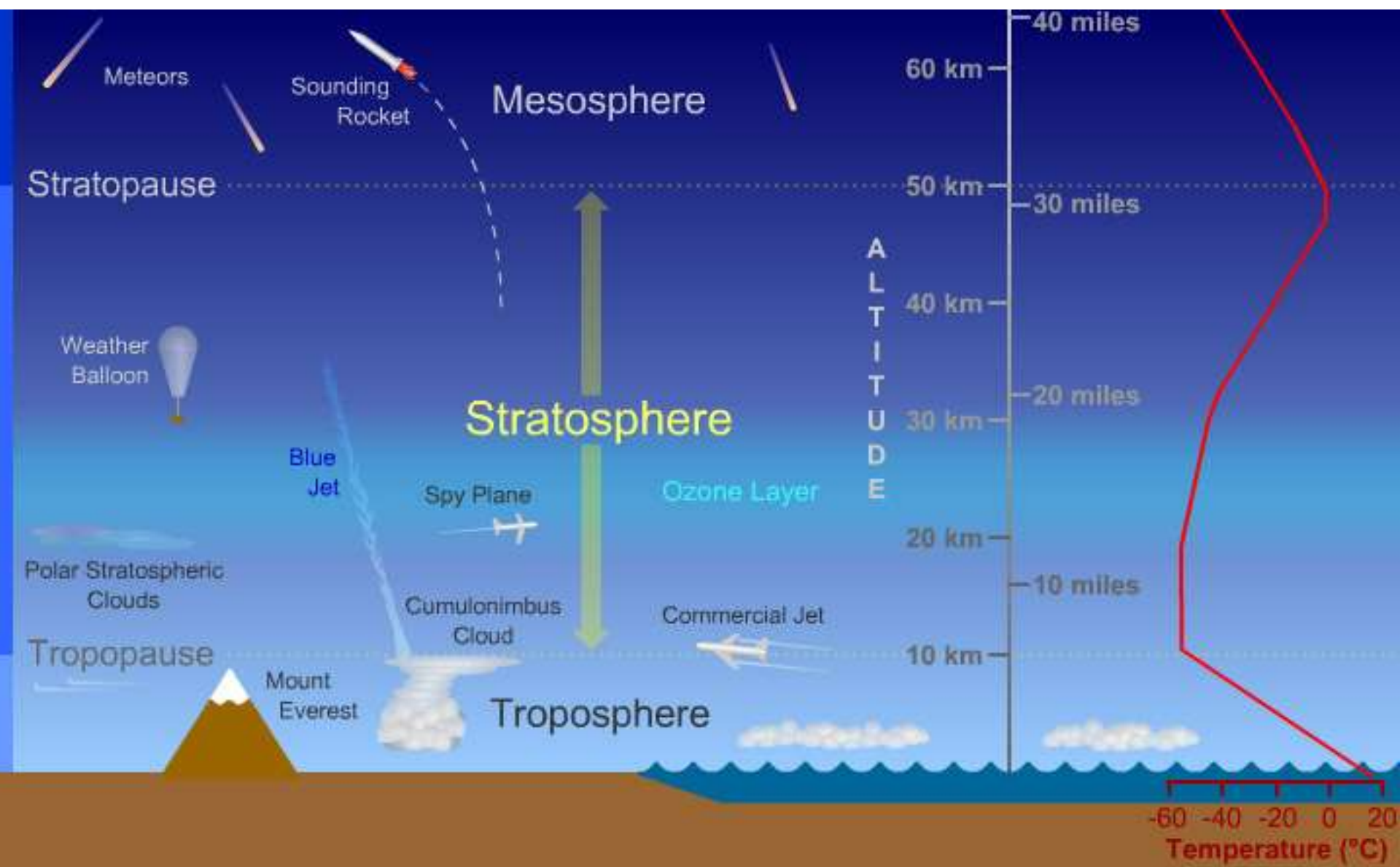
- Mahaweli River
- Malwathuoya River
- Deduruoya River
- Galoya River
- Mundanai River
- Maduruoya
- Kalaoya River
- Kanagarayan Aru
- Yanoya River

## Recent Heavy Rain falls:

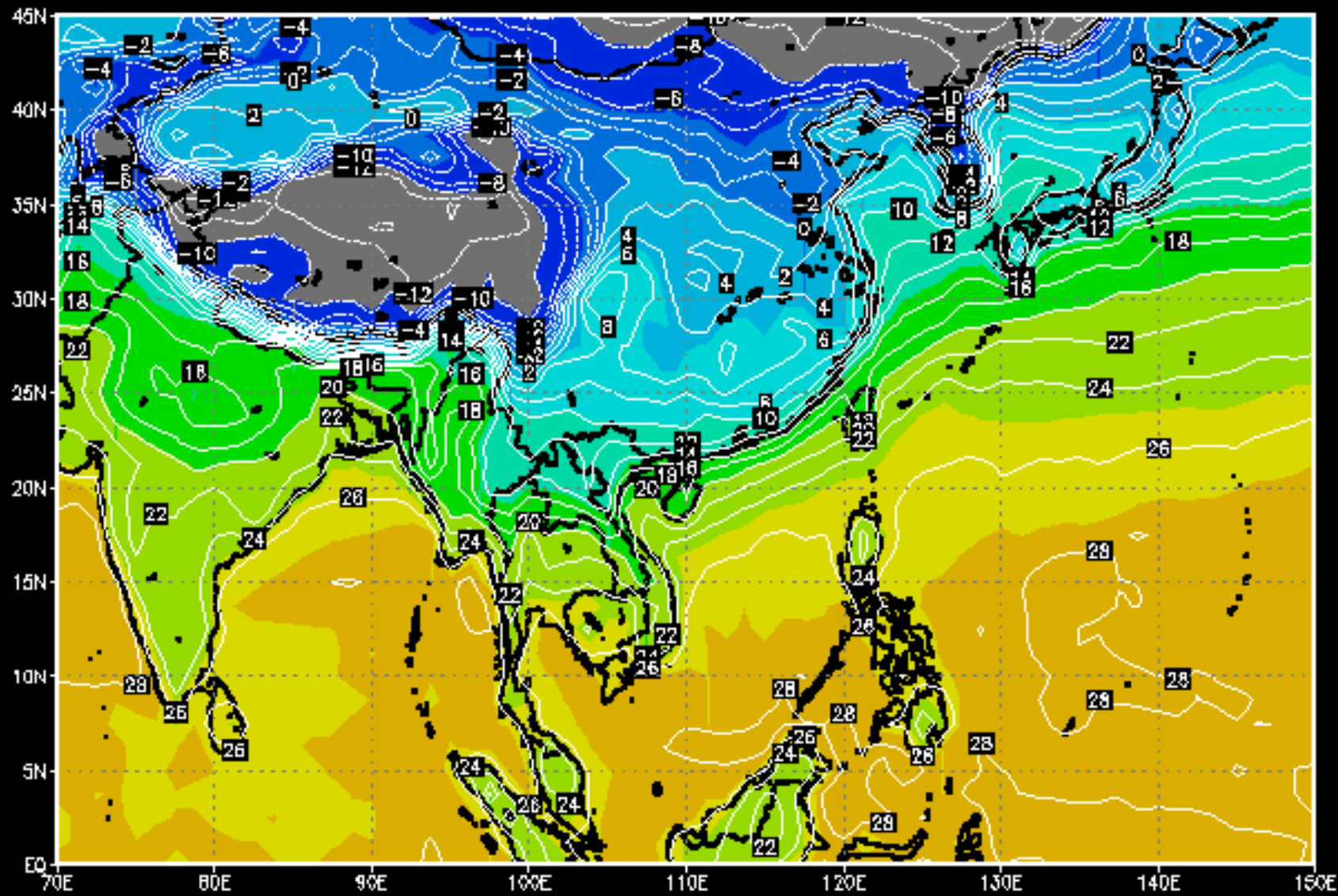
Rainfall of 492 mm in 24 hours in 1992 in Colombo and 620 mm rainfall in 48 hours in Aagalawata in June 2014 were received.

# Sun Vs Earth - Annual Position



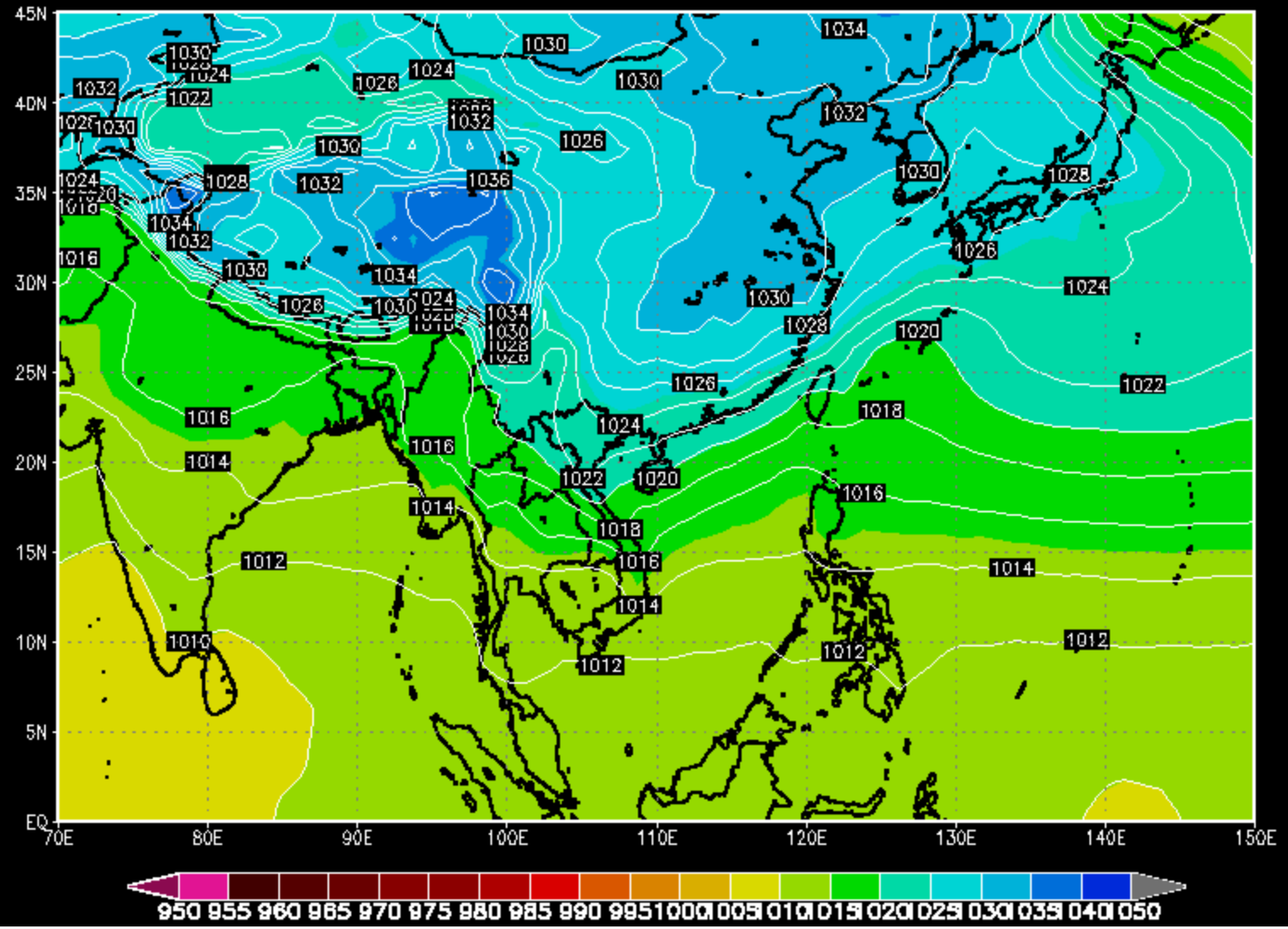


# RJTD Air Temperature unit Celcius 06Z06DEC2015



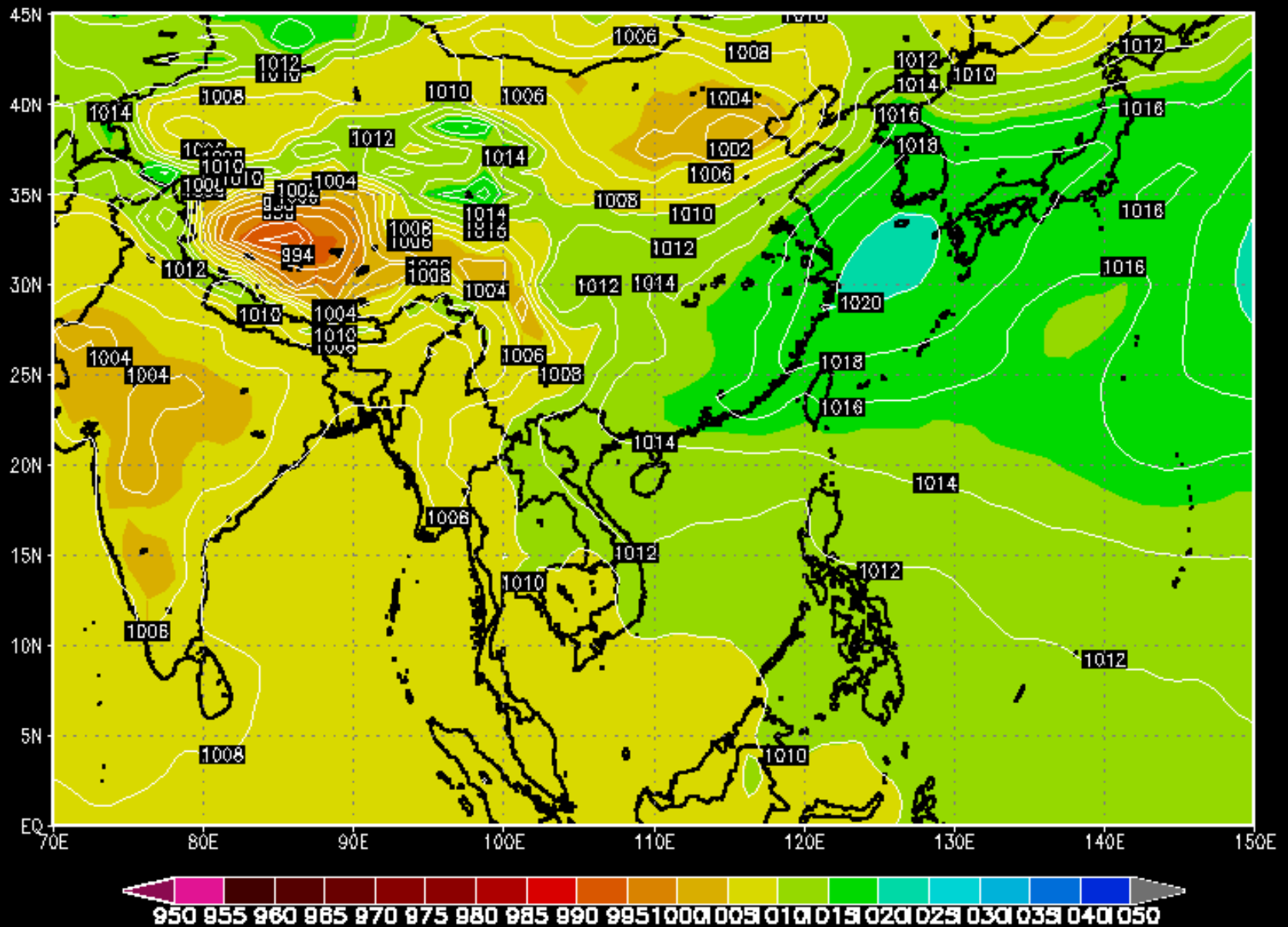
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# RJTD Air Surface Pressure unit Millibar 06Z06DEC2015



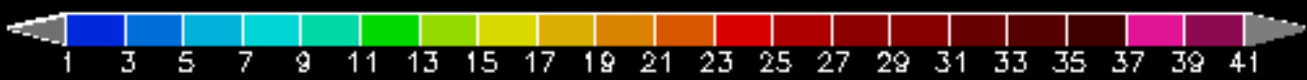
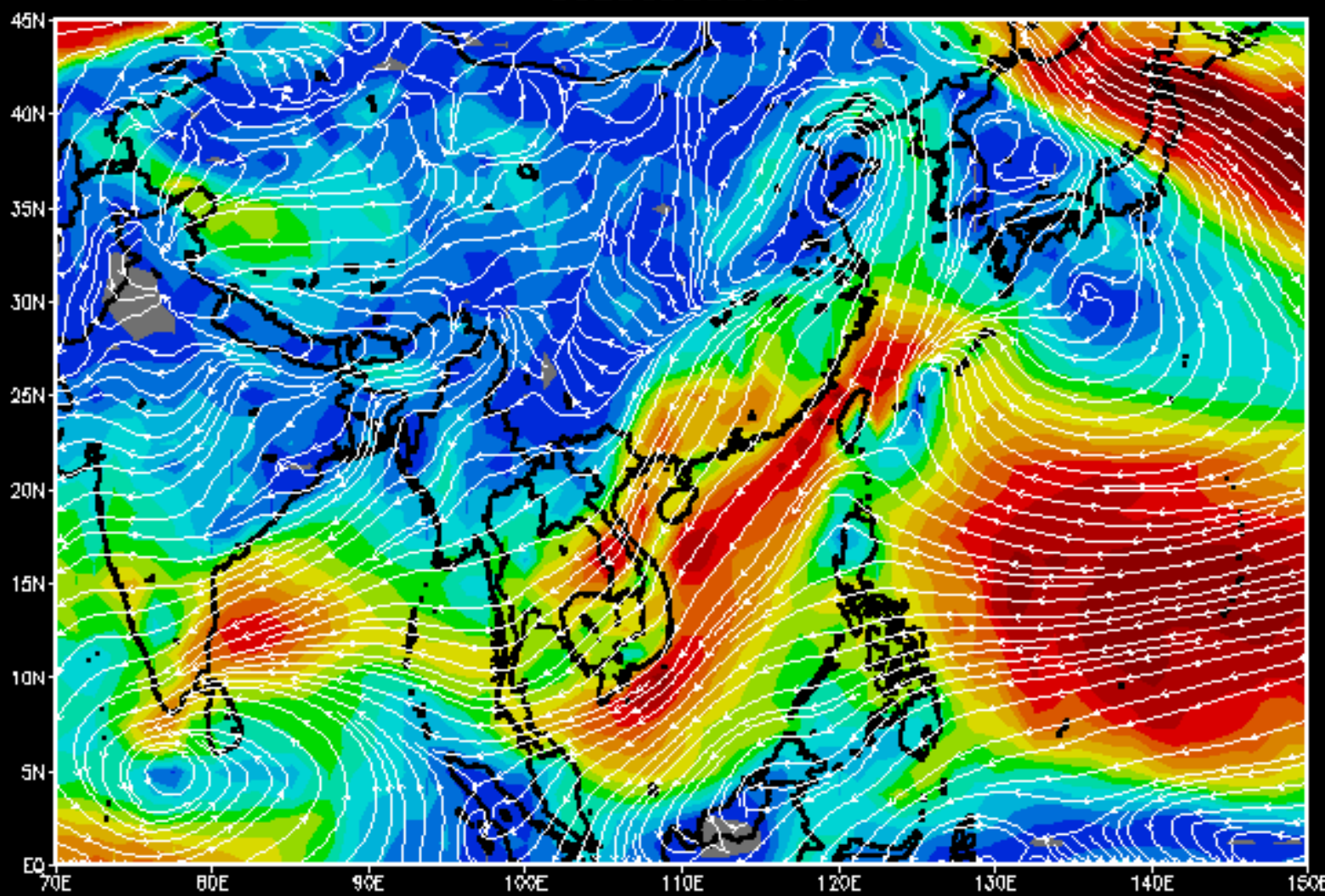
# RJTD Air Surface Pressure unit Millibar

## 09Z06MAY2014

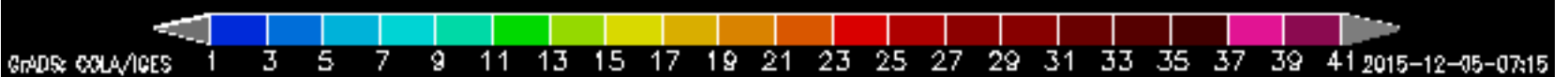
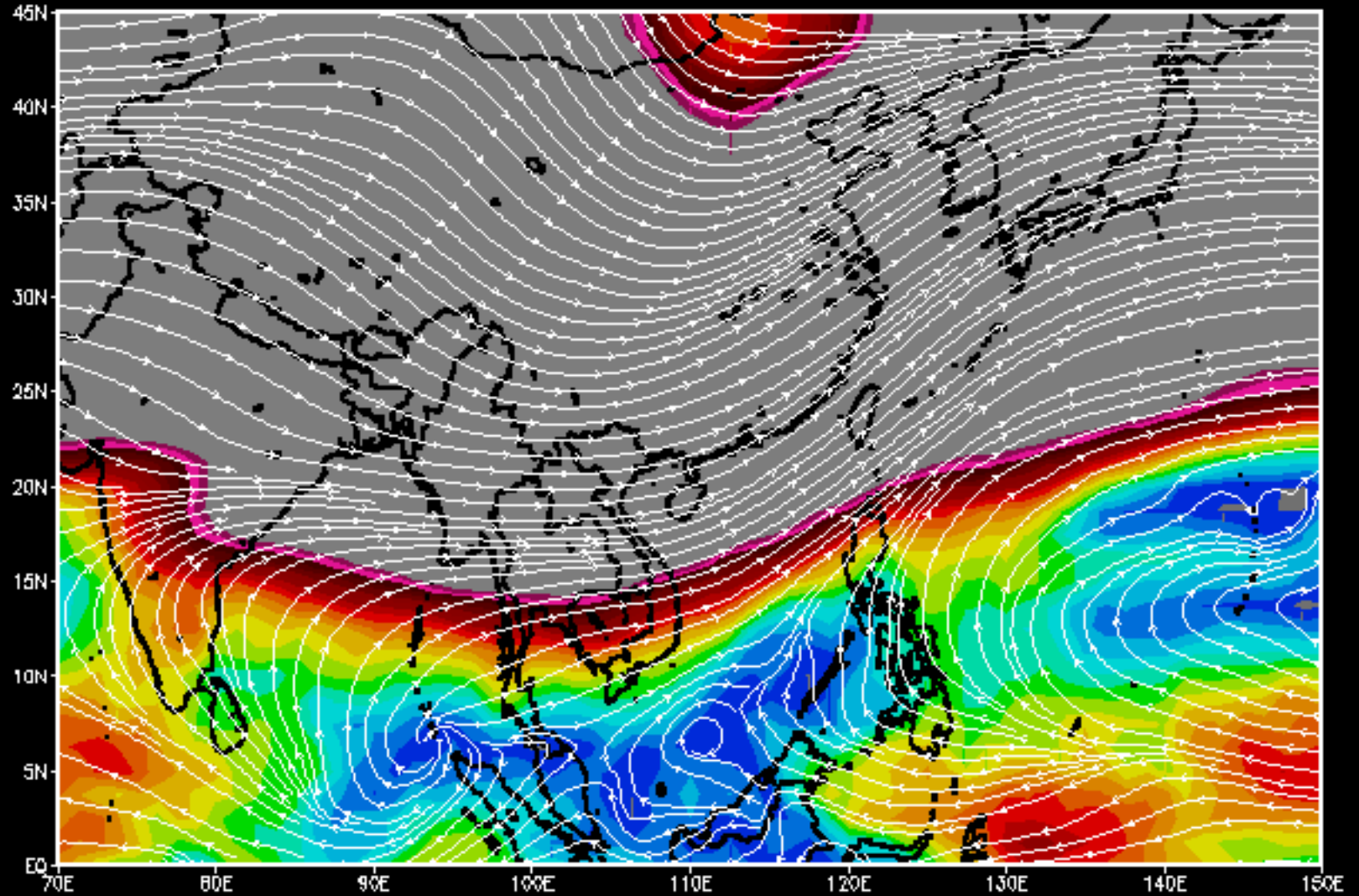




RJTD Wind 925 hPa Unit Knots  
06Z06DEC2015

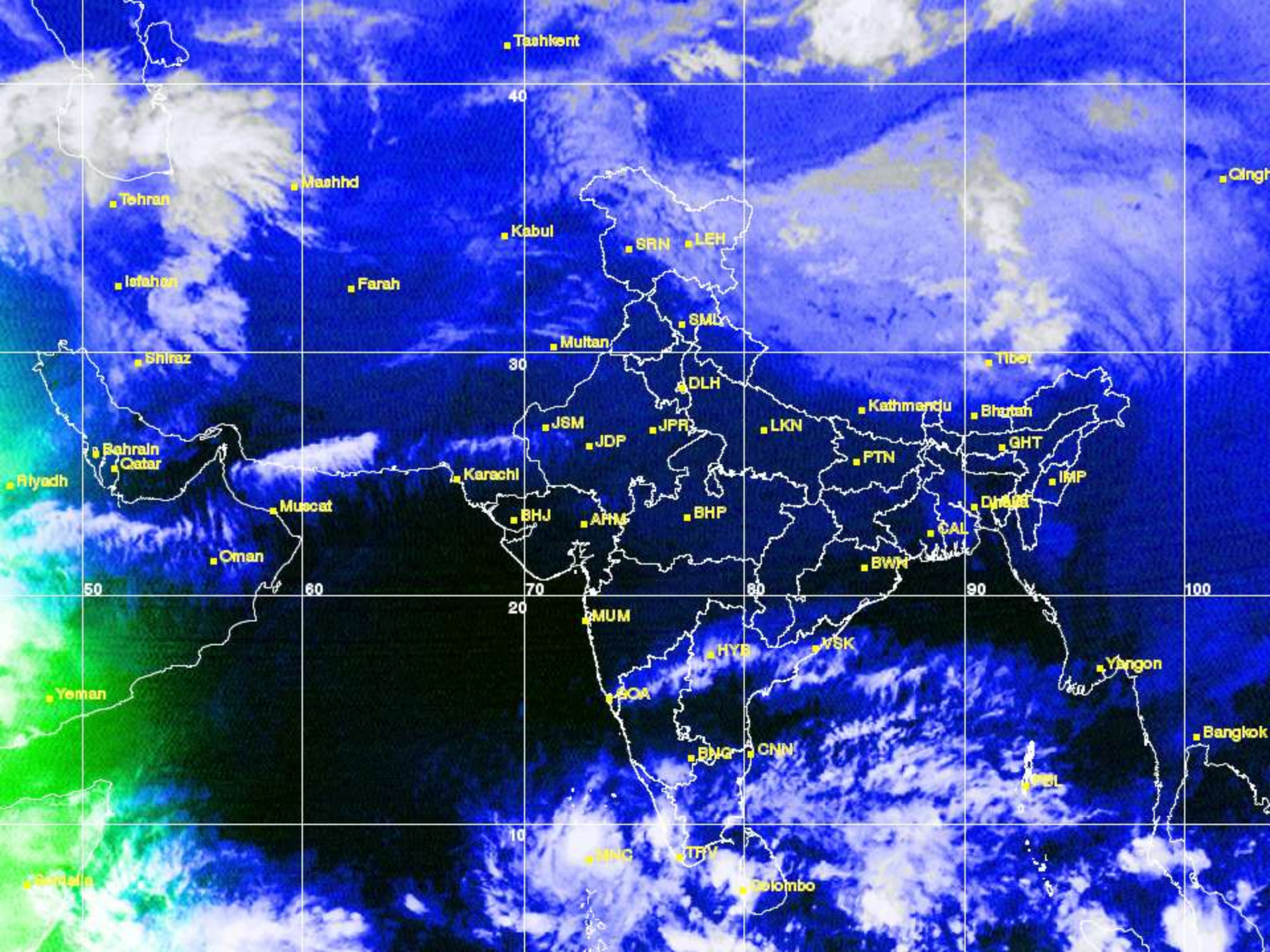


RJTD Wind 200 hPa Unit Knots  
06Z06DEC2015



GrADS: CCLM/IGES

2015-12-05-07:15



# Historical Settlements

- Along the River Banks (A'pura, Ratnapura, Kandy, Polonnaruwa, Gamphaga) due to water and transport in river
- River Flood plains (Colombo, Galle, Matara, Ambalantota, Jaela, Chilaw, Kalmunai) due to water & cultivation

# New Developments

- Open lands is available in low lying area.
- New settlements, Industries, Stores etc. in Low lying area along river bank and flood detention area.
- Encroachments in reservations.
- Expansion of Cities in the flood plains

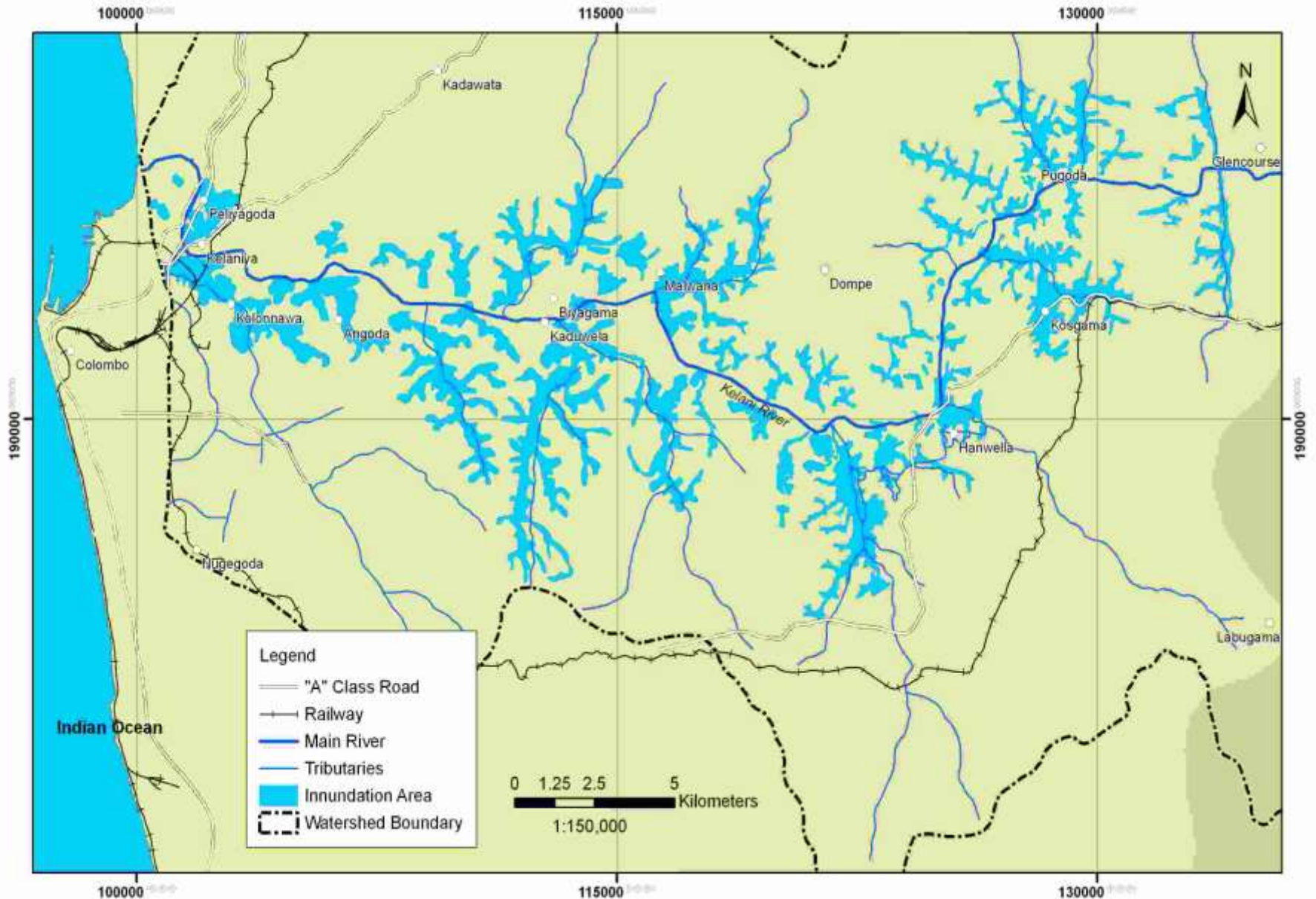








# Flood Inundated Area in Kelani Ganga Basin



## **Kelani River**

The Kelani river basin which is located entirely in the wet zone of the country has catchment area of 2,292 square kilo meters and annual run off of 3,417 million meter cube. The river bed level at mouth is minus five meter MSL and at Hanwella is zero meter MSL. The upper part of the basin (upstream of Hanwella) is mountainous while the lower part (below Hanwella), has plain features. The basin receives about 2400 mm of average annual rainfall and the river carries average flow of about 800-1500 m<sup>3</sup>/s during monsoon periods and some 20-25 m<sup>3</sup>/s in the dry season.

## **Flood Bunds**

The floods are classified into four level based on the magnitude of damages and Nagolagam Street gauge readings as follows. Minor flood: 5-7 feet, Major flood: 7-9 ft, Dangerous flood: 9-12 ft, Critical flood: more than 12 ft.

Flood bunds were constructed in 1930 to provide flood protection to Colombo city and Kelani city on Southern side & Northern side of Kelani Ganga respectively. Southern side flood bund is to protect 12 feet Critical flood. But Northern side flood bund was built to protect 9 feet Dangerous flood. The flood bund on Southern side is railway tract from the Colombo Harbour to Kolonnawa to transport oil and this flood bund is not close river bank, not parallel to river and therefore about 2000 Hectares of valuable lands now unprotected and urbanized partly. Many families are living at unprotected area. The Northern side flood bund is between Peliyagoda to Talwatte with length of 7.5 km and top level has been risen assame as Southern side flood bund in 1990 to 2004.

In order to control of inundation of the small areas in above upper reaches along river bank during minor flood, about 42 minor flood protection (MFP) schemes were constructed by Irrigation Department to protect Senasumgoda, Pugoda, Nikawela, Modarakada, Yattowita, Kadatiyawatta, Moraela, GontotaEla, etc. on Northern side and Ambatale, Kelanimulla, Sedawatta etc. on Southern side. The flood higher water level in Kelani Ganga is not allowing these local drainages flow into the river. These bunds are designed to accommodate 200 mm of daily rain fall as it was felt sufficient at that time. The inundation of lands in Ambatale, Kaduwela, Biyagama, Malwana area was not considered as important.

## **Standing order**

The standing order prepared by Irrigation Dept. in 1993 describe the flood early warning system, inundation area by different flood levels, methods for Hydrological monitoring, timing for warning, route and method for information dissemination to related organizations, flood defense works etc. If flood level reaches 5 feet and it is likely to rise further, Early Warning to the people in high-risk area through the Disaster management center, District Secretary Colombo, District Secretary Gampaha, Local authorities, Media and Police and Convene flood committee. The relevant offices of Irrigation Department will closely monitor gauge readings, rainfall, gates operations, ready with gunny bags and coordinating with flood committee.

# River Flood Mitigation

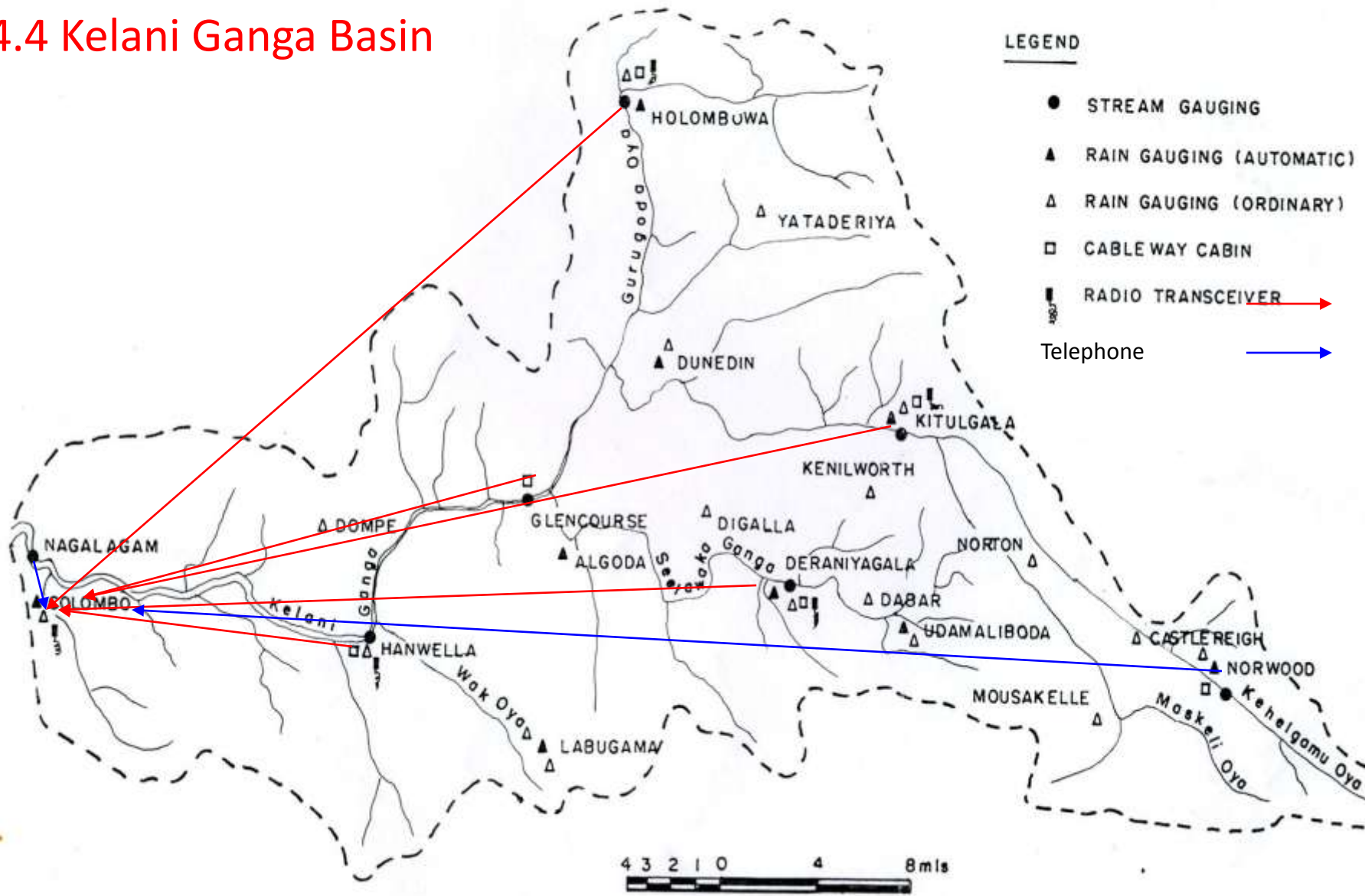
- Kelani river – 13 km length and 7 meter height  
2 flood bunds to protect Colombo & Kelani Cities.  
Other 44 minor flood schemes between Hanwela and Sea.
- Gin ganga River – Flood bunds and Electric Pump Houses.
- Nilwala ganga River – Flood bunds and Diesel Pump Houses.
- Kaluganga River – Flood bunds.
- Other Rivers – Irrigation Reservoirs etc.
- Minor flood level =200 -250 mm rainfall in two days

# River Flood Forecasting

- Wet Zone - Kelani , Kalu, Gin & Niwala are the main river basins in the wet Zone
- Dry Zone – Mahaweli, Maduru Oya, Mundeni aru, Kirindi Oya, Maha oya, Deduru oya, Mee Oya, Malwathoya
- 34 River Gauging stations

## 4.4 Kelani Ganga Basin

MAP OF KELANI RIVER BASIN

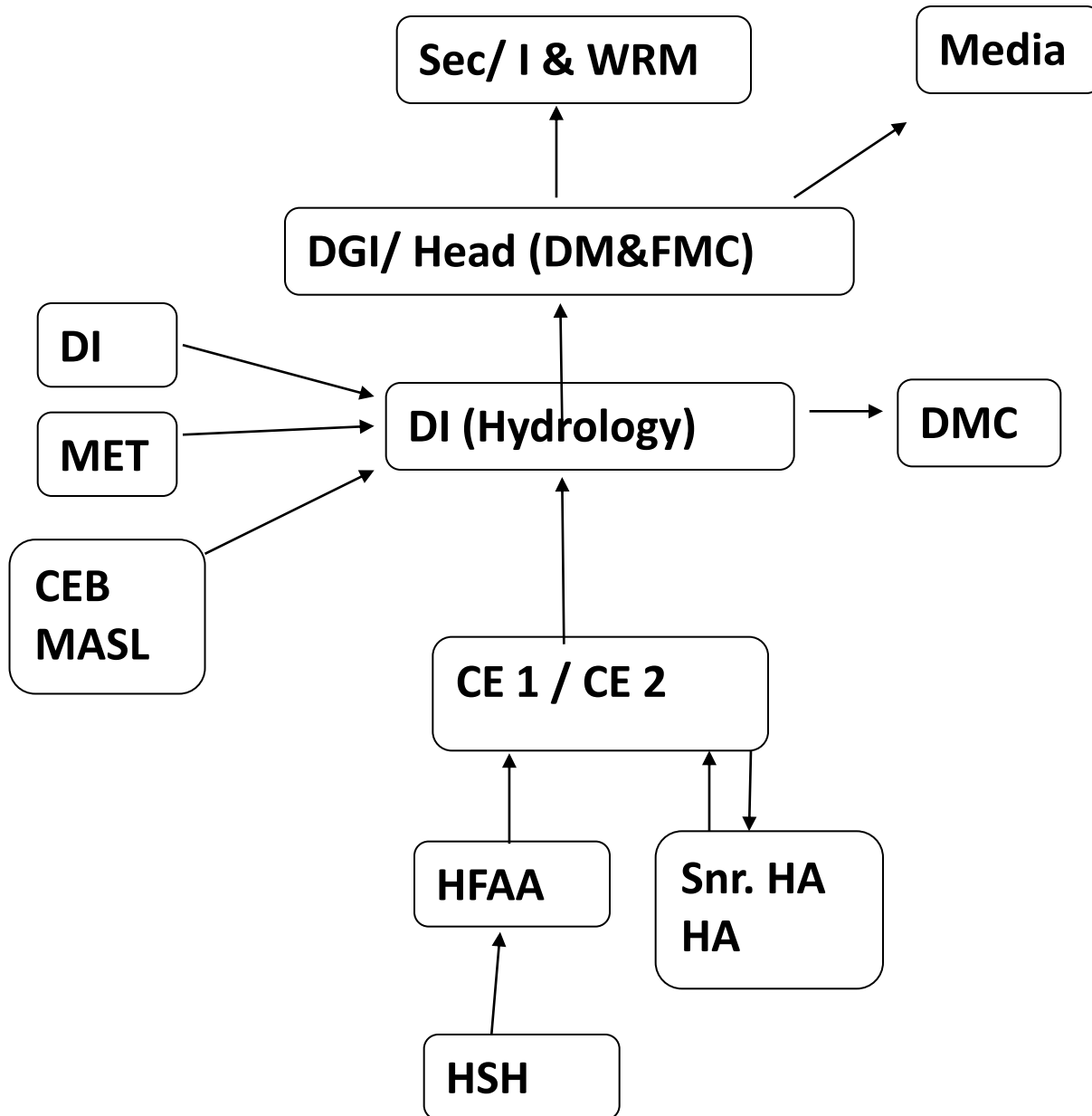




# In Normal Situation

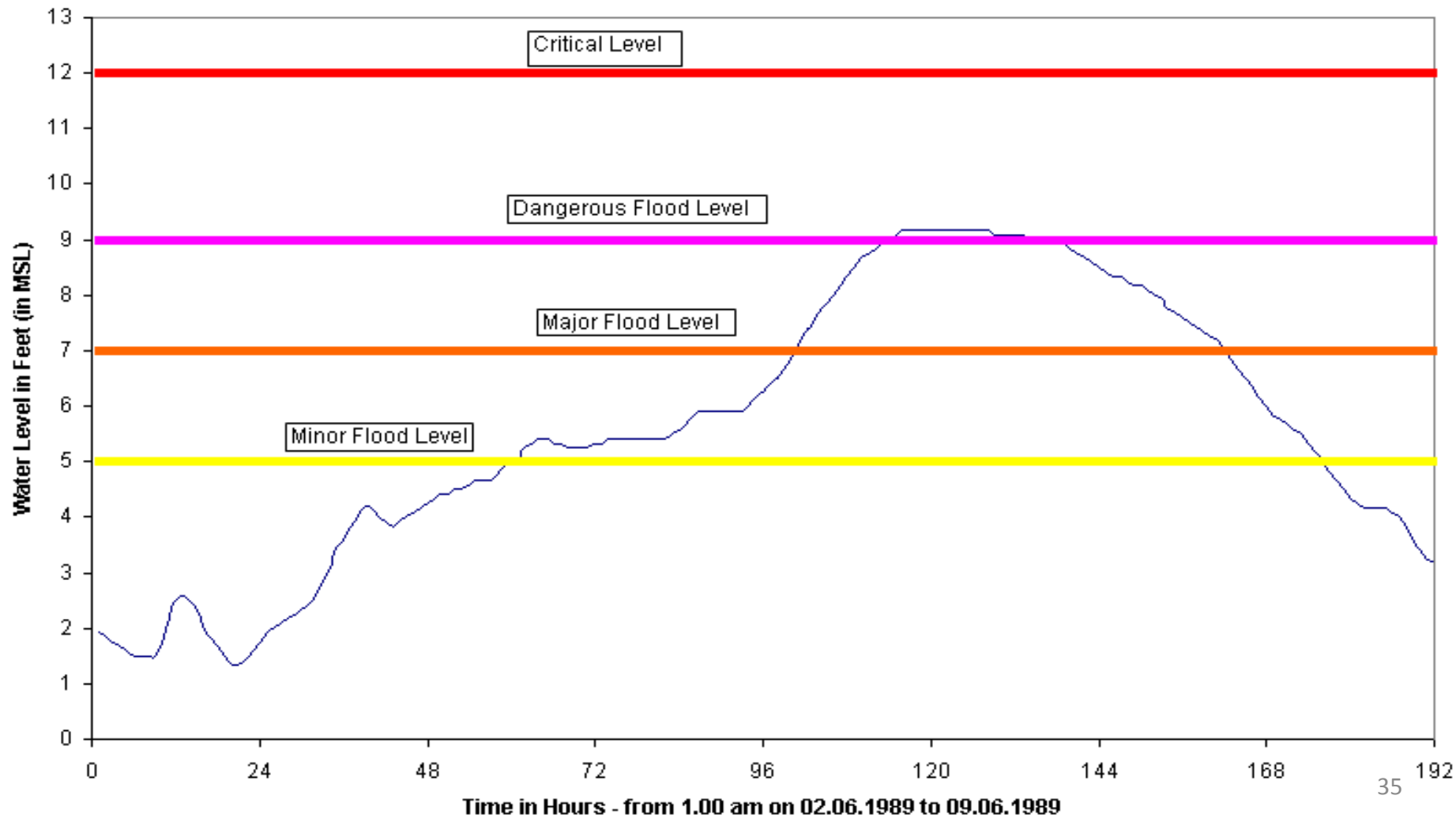
- The river stages and the rainfall of key stations of these rivers are monitored continuously
- Hourly data is recorded.
- Data are sent 2 times per day to Hydrology branch.

## Flood Monitoring: - Message Dissemination System- River Floods



Sec – Secretary/ I&WRM  
 DGI – Director General of Irrigation  
 H/DM FMC- Head/ Disaster Management and Flood Monitoring Committee  
 DMC- Disaster Management Center  
 DI (Dis) - Director of Irrigation (District)  
 D/s/ DI - Director of Irrigation (District) at Down Stream  
 DIE – Divisional Irrigation Engineer  
 CE – Chief Engineer  
 CEB – Ceylon Electricity Board  
 MASL – Mahaweli Authority of Sri Lanka  
 HFAA – Hydrological Field Assistant  
 HA- Hydrological Field Assistant  
 Dis. Sec- District Secretary  
 Div. Sec- Divisional Secretary  
 WMS- Water Management Secretariat  
 EA- Engineering Assistant  
 PMC- Project Management Committee  
 FO- Farmer Organization  
 GN- Grama Niladhari

### Dangerous Flood in 1989 - Kelani Ganga at Nagalagam Street



The severe floods occurred in the past with Gauge reading at Nagollagam are as follows. (1837-13.5ft, 1947-12.85ft, 1922-12.6ft, 1872-11.9ft, 1925-11.5ft, 1913-11ft, 1940-11ft, 1930-10.91ft, 1906-10.8ft, 1937-10.3ft, 1904-9.9ft, 1891-9.8ft, 1933-9.5ft, 1936-9.4ft, 1989-9.2 ft.)

The flood bund was over topped in 1930, 1937, 1940 and 1947

River	Gauging Station					Water Level at 9:00 AM
	Station	Unit	Alert Level	Minor Flood Level	Major Flood Level	
Kelani Ganga (RB 01)	N' Street	ft	4.00	5.00	7.00	0.40
	Hanwella	m	7.00	8.00	11.00	0.74
	Glencourse	ft	50.00	55.00	65.00	28.95
	Holombuwa	ft	10.00	11.00	16.00	1.05
	Deraniyagala	ft	16.00	19.00	21.00	0.60
	Kitulgala	m	2.00	3.00	5.00	0.67
	Norwood	m	1.50	2.00	2.15	0.33

Seri. No.	District	DIE Division / MET / Hyd Br.	Station	River Basin	Cumulative rain fall (Oct'15 to Jan'16)	Monthly Total	Long term monthly average of principal stations	Jan-16					
								1	2	3	4	5	6
1	Ampara	Ampara	Ampara Tank	Galoya	1627.0	319.9	313.0	17.9	5.0	0.0	0.0	74.9	114.3
2	Ampara	Ampara	Inginiyagala	Galoya	1339.7	230.6		6.1	0.0	0.0	0.0	11.5	91.2
3	Ampara	Ampara	Uhana	Galoya	1577.3	259.5		17.7	0.0	0.0	3.8	15.2	128.2
4	Ampara	Ampara	Himidurawa	Galoya	1491.2	210.5		8.8	0.0	0.0	0.0	27.9	116.8
5	Ampara	Ampara	Weeragoda	Galoya	897.3	104.1		4.7	0.0	0.0	0.0	7.6	71.1
6	Ampara	Ampara	Annamalai	Galoya	841.0	154.7		19.0	0.0	0.0	0.0	48.2	68.5
7	Ampara	Ampara	Gonagolla	Galoya	1225.9	139.5		0.0	0.0	0.0	0.0	0.0	85.0
8	Ampara	Ampara	Sinnawaththa	Galoya	922.9	127.9		0.0	0.0	0.0	0.0	0.0	78.7
9	Ampara	Ampara	Bokkebedda	Galoya	1542.3	202.2		43.1	0.0	0.0	5.0	22.8	68.5
10	Ampara	Ampara	Wawinna	Galoya	1523.4	298.1		13.9	0.0	0.0	0.0	27.9	119.3

*Thank You*