Study of Weather Systems Causing Cold and Heat Waves over India

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- **Cold waves disrupts life in north India Jan-Feb2008**
- **Mumbai experiences cold waves/cold day conditions first so ever in first week of February08**
- **Freezing Friday (1Feb08)- Prediction ?**
- **Continuously week long snowfall over hilly regions of NW India(J&K, H.P. and Uttrakhand) blocks Jammu Sringar Highway**

- **Prolonged heat wave conditions over northern regions of India during From Mid April through the 3rd week of May2002. Maximum Temperature at Gannavaram (Vijayawada) reached 49 Deg. C (WMO 2003)**
  Caused more than 1000 fatalities.

- **Severe heat wave conditions over Gujarat, Bihar, Orissa, north-interior Karnataka and over coastal Andhra Pradesh and maximum temperature were generally above normal**
  by more than 4 Deg. C. over rest of Andhra Pradesh during 2nd half of May2003
  Caused nearly 1400 human casualties

- Due to cold waves and frost about 600 ha of orchards of mango and litchi were severely damaged in the Hoshiarpur district of Punjab. The extent of damage varied from 40-100% in mango, 50-80% in litchi with reduced fruit size and poor quality in guava, ber and kinnow. Similar damage was also previously reported from Kurukshetra district during December2000-2001

- Appreciably above normal temperatures in last week of February and in March causes loss to wheat production (2007) etc. etc.

- ???

3) Cold waves:

A) If climatological normal minimum/night temperature is less than 10 Deg. C and

Actual observed fall is 4-5 Degree C than it's cold wave conditions

when, Observed fall is >5 Degree C than severe cold wave conditions

B) If climatological normal minimum/night temperature is more than 10 Deg. C and

Actual observed fall is 5-6 Degree C than it's cold wave conditions

When, observed fall is >6 Degree C than severe cold wave conditions

4) Heat Waves:

A) If climatological normal minimum/night temperature is less than 40 Deg. C and

Actual observed rise is 5-6 Degree C than it's Heat wave conditions

when, Observed rise is >7 Degree C than severe Heat wave conditions

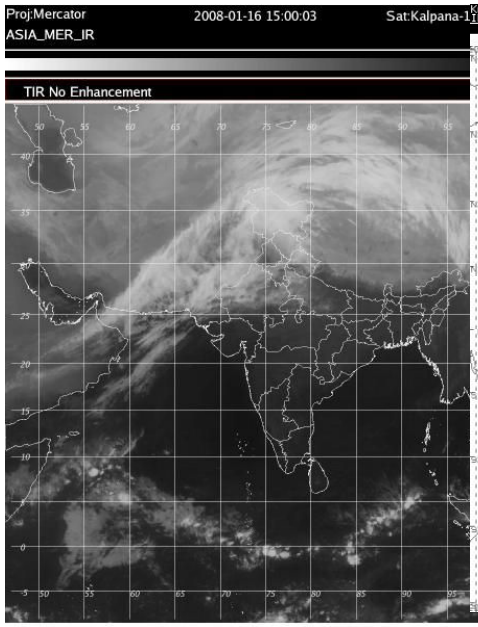
B) If climatological normal minimum/night temperature is more than 40 Deg. C and

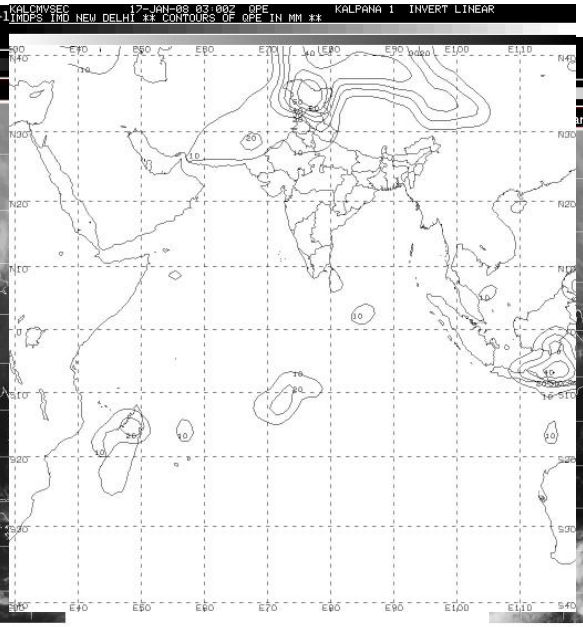
Actual observed rise is 3-4 Degree C than it's Heat wave conditions
When, observed rise is >5 Degree C than severe Heat Wave conditions

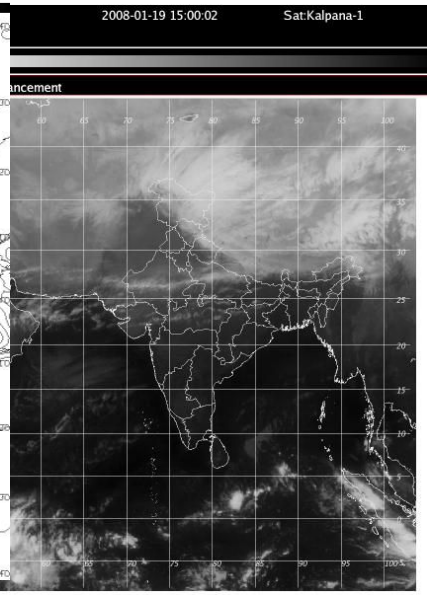


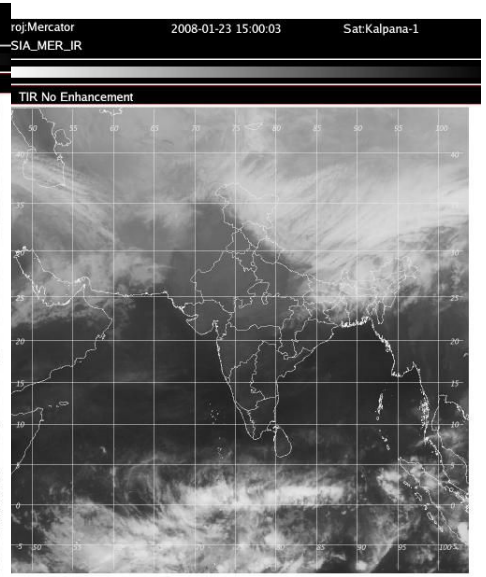
Cold Waves
Analysis & Predictions

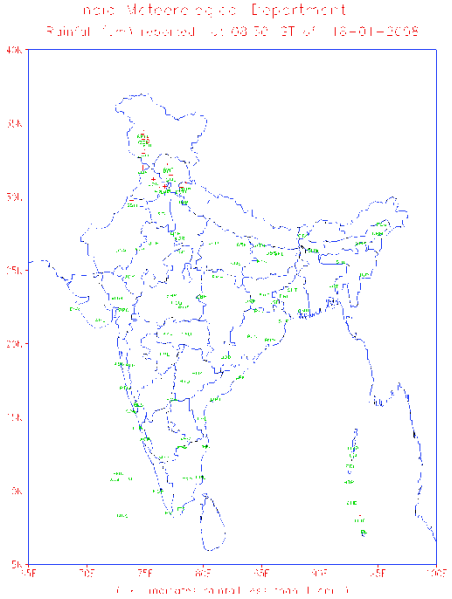
18Jan08 QPE 18 Jan08 19Jan08 23Jan08

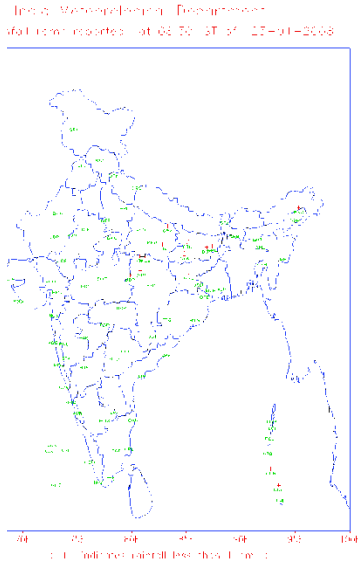


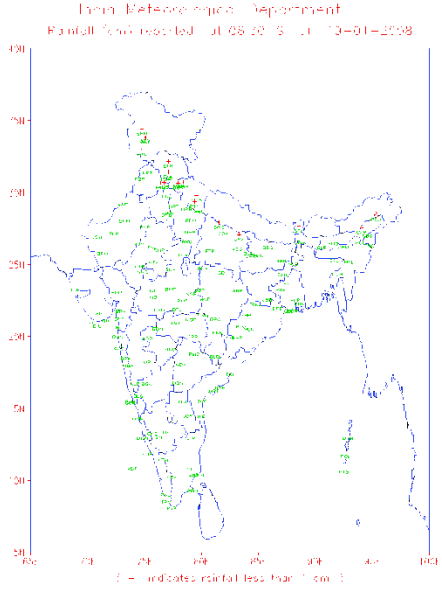












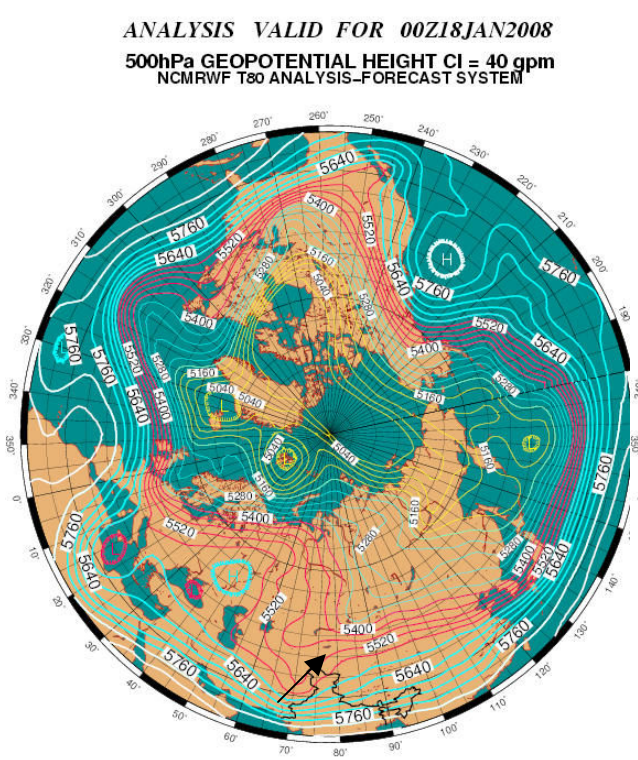

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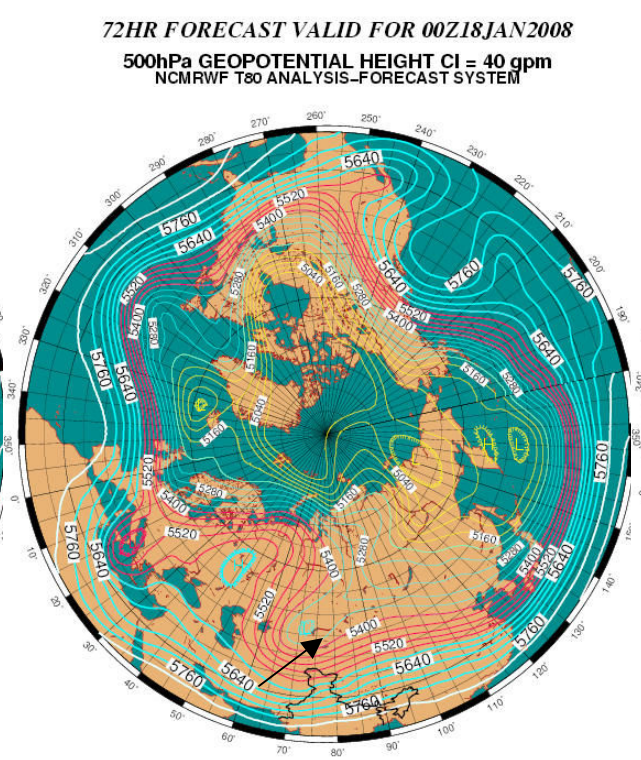

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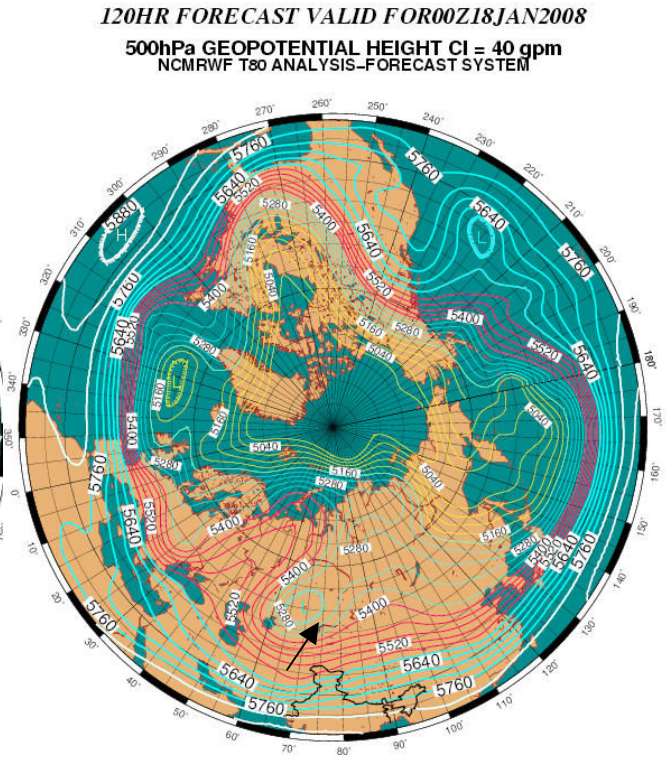

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Real Time Predictions of Westerly Waves by NWP Model(T80) (500 hPa. Level)

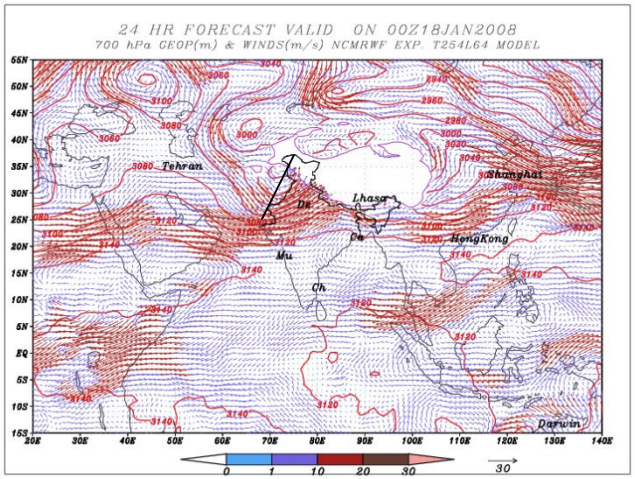
Analysis: 18Jan08 Day-3 FC for 18Jan08 Day-5 FC for 18Jan08



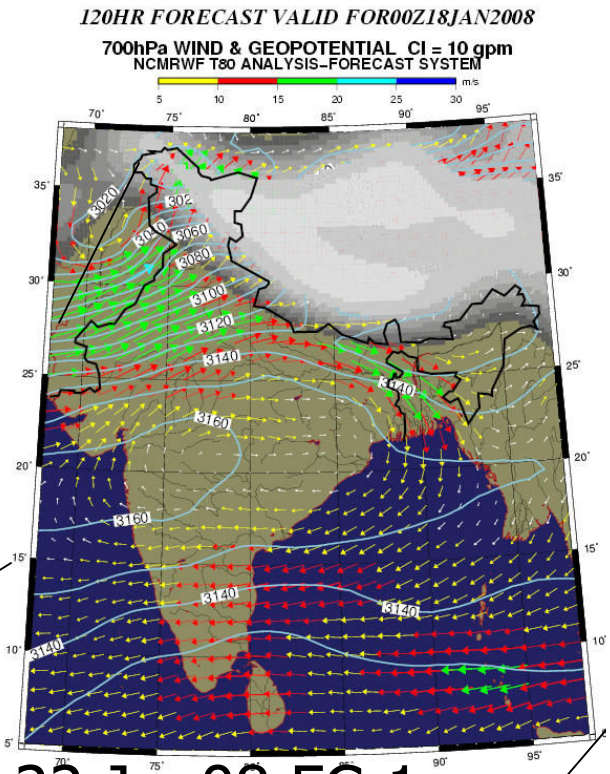




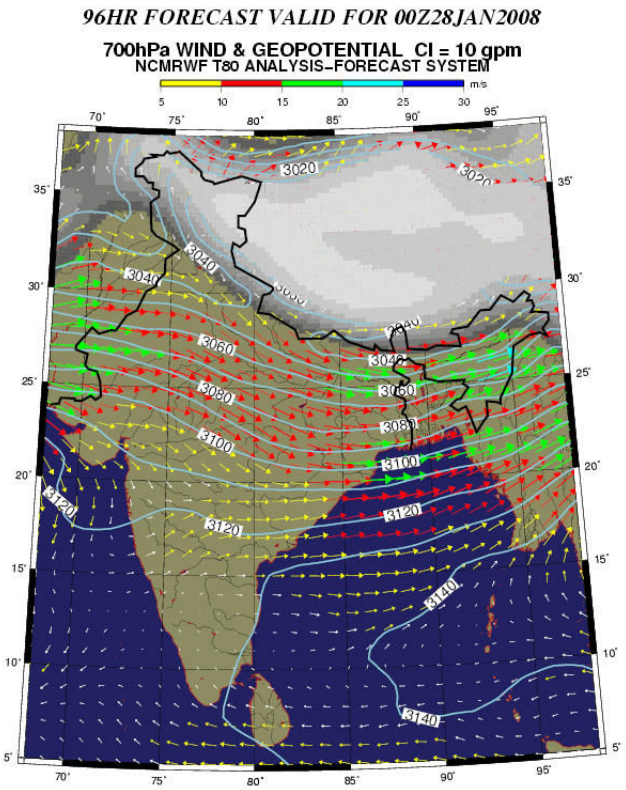
18 Jan08 FC-D1 (T254) SW ly winds



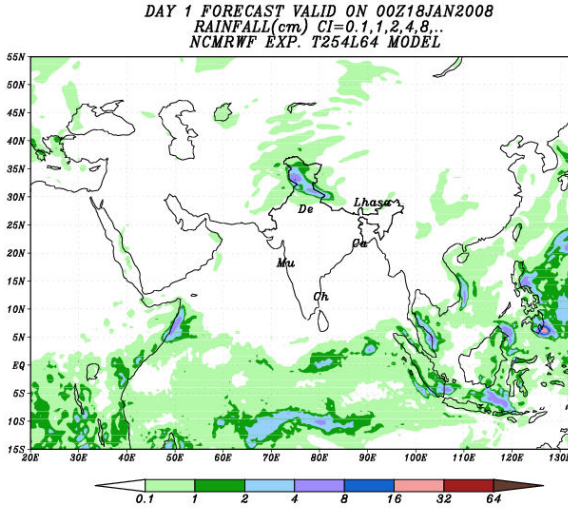
18 Jan08 FC-D5(T80)



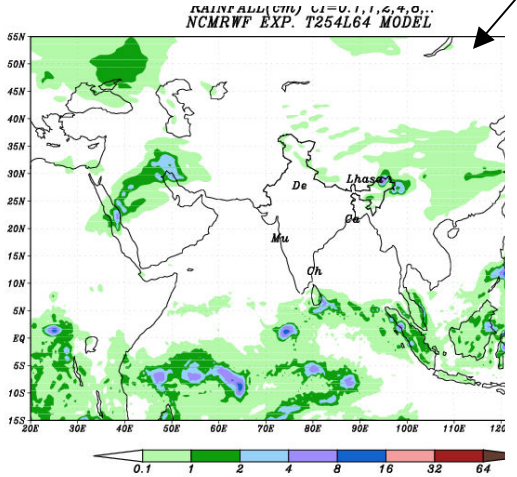
27Jan08 FC-D5 NW ly

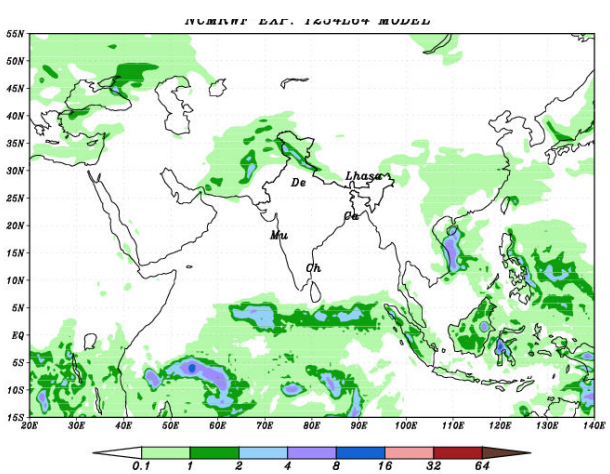


18 Jan08 FC-D1

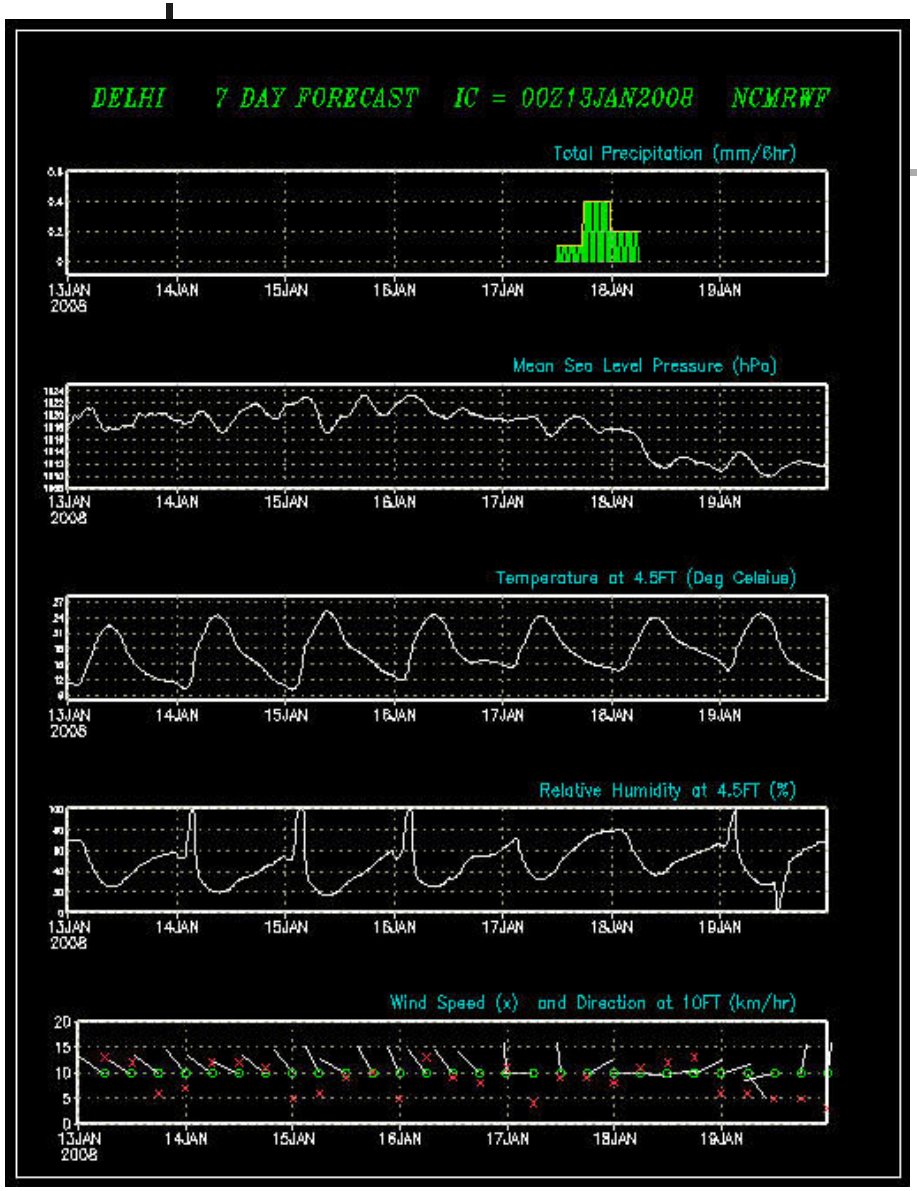


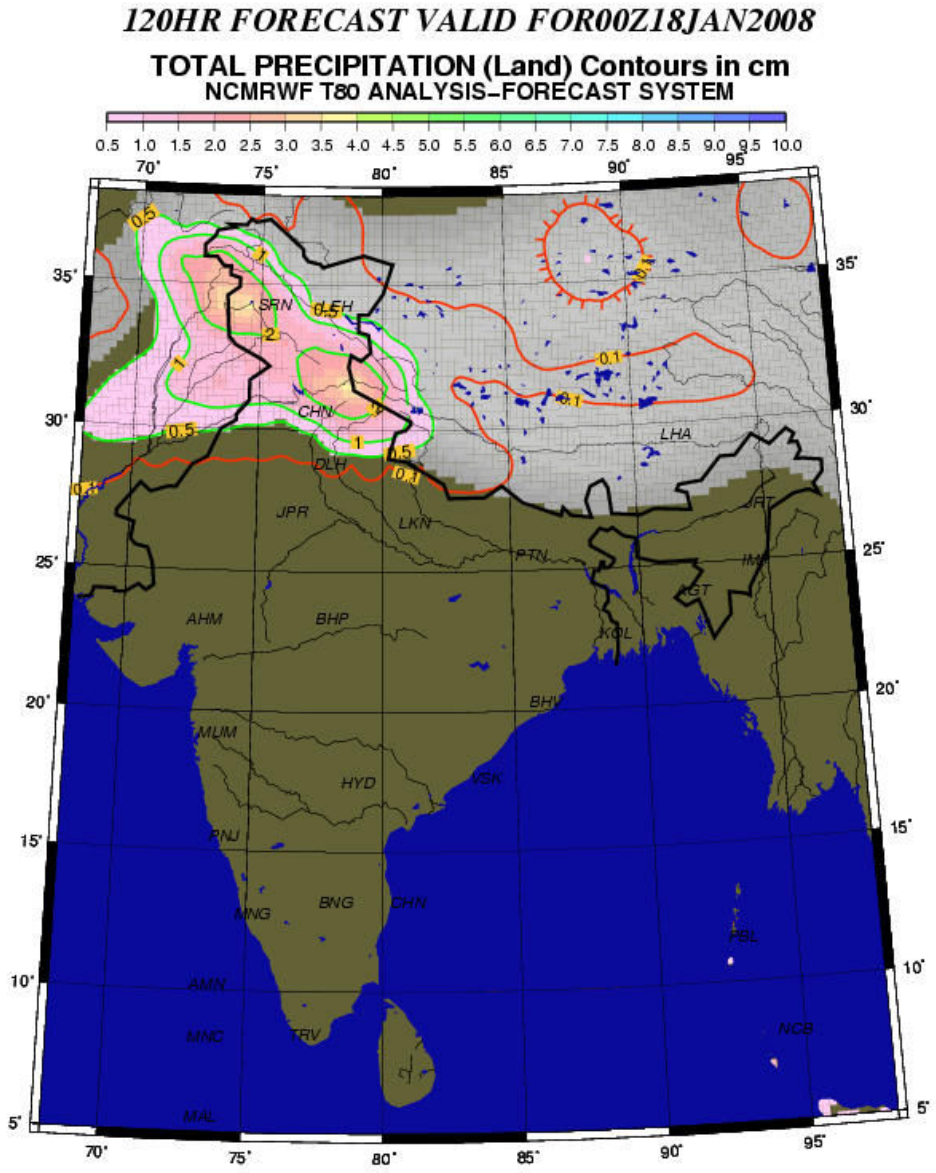
22 Jan08 FC-1



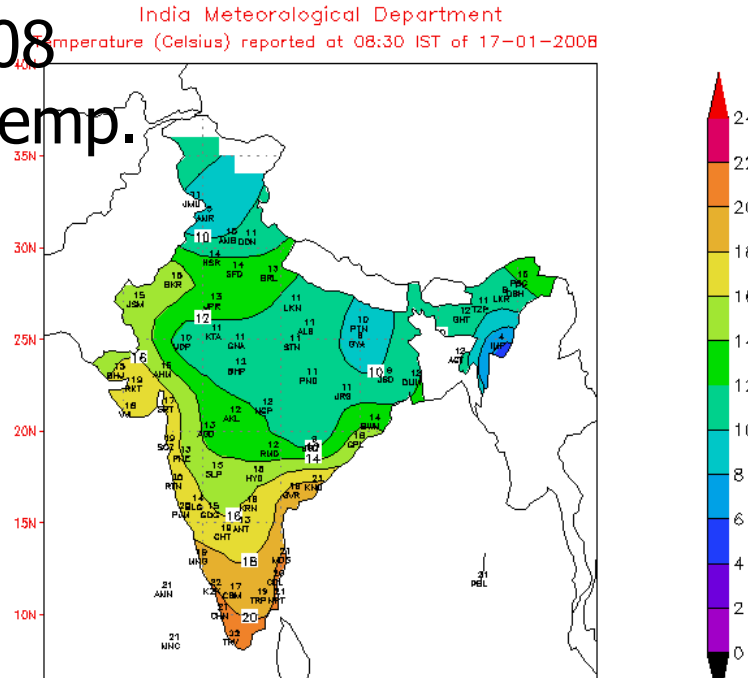


Day-5 FC (Snow/Rain) over NW India Including over Delhi Valid for 18 January 08

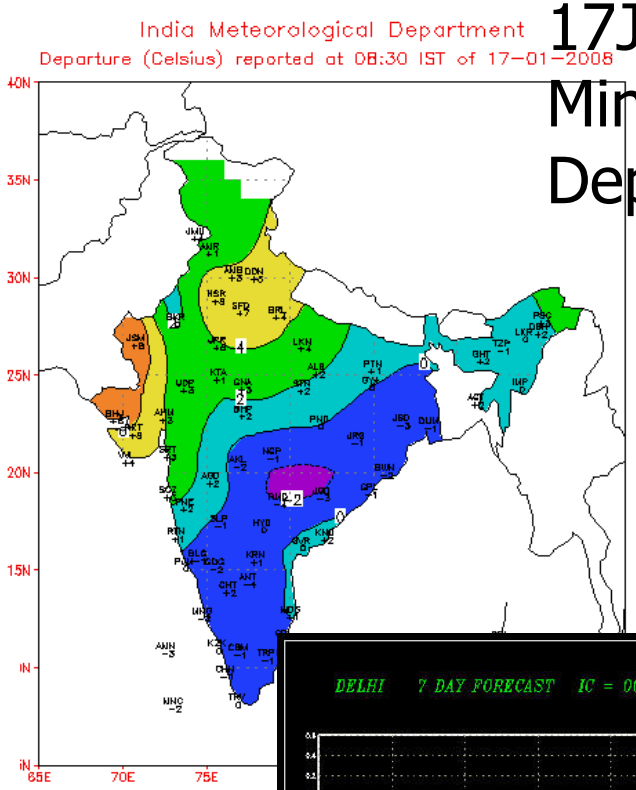


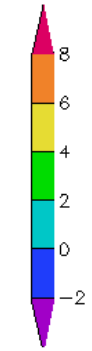


17Jan08
Min. Temp.
Obsn.

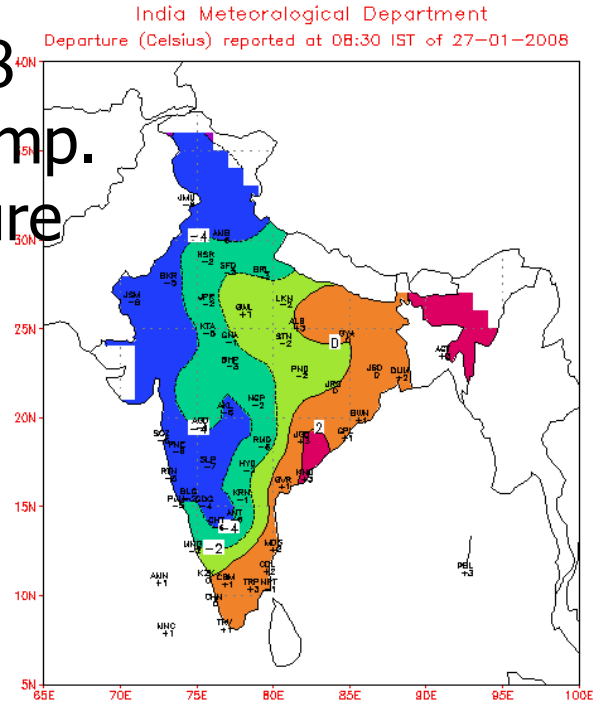


17Jan08
Min. Temp.
Departure



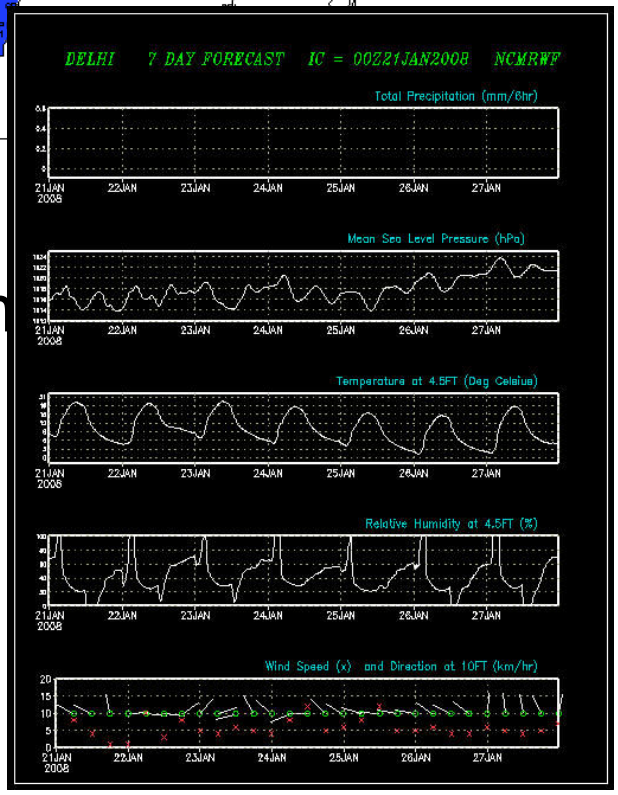


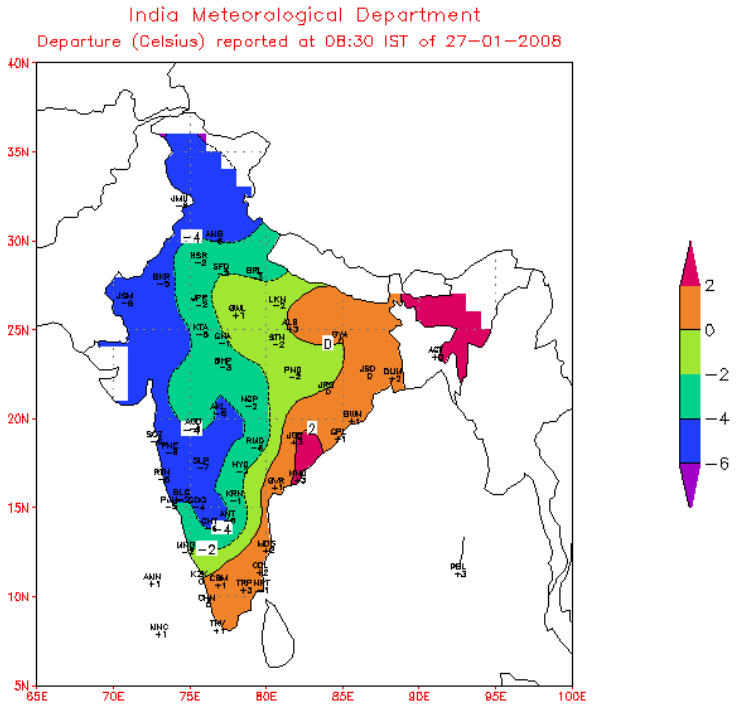
27Jan08
Min. Temp.
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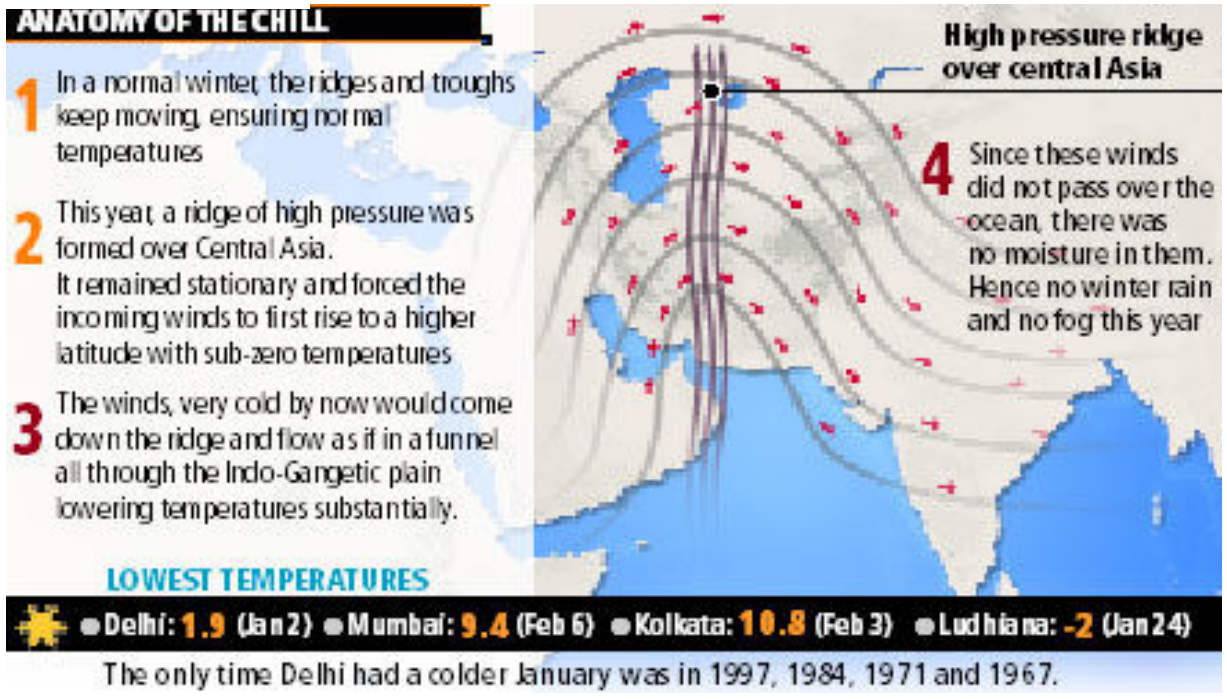




IC
21Jan
2008




India Meteorological Department
Departure (Celsius) reported at 08:30 IST of 27-01-2008
40N
35N
30N
25N
20N
15N
10N
5N
65E
70E
75E
80E
85E
90E
95E
100E
2
0
−2
−4
−6

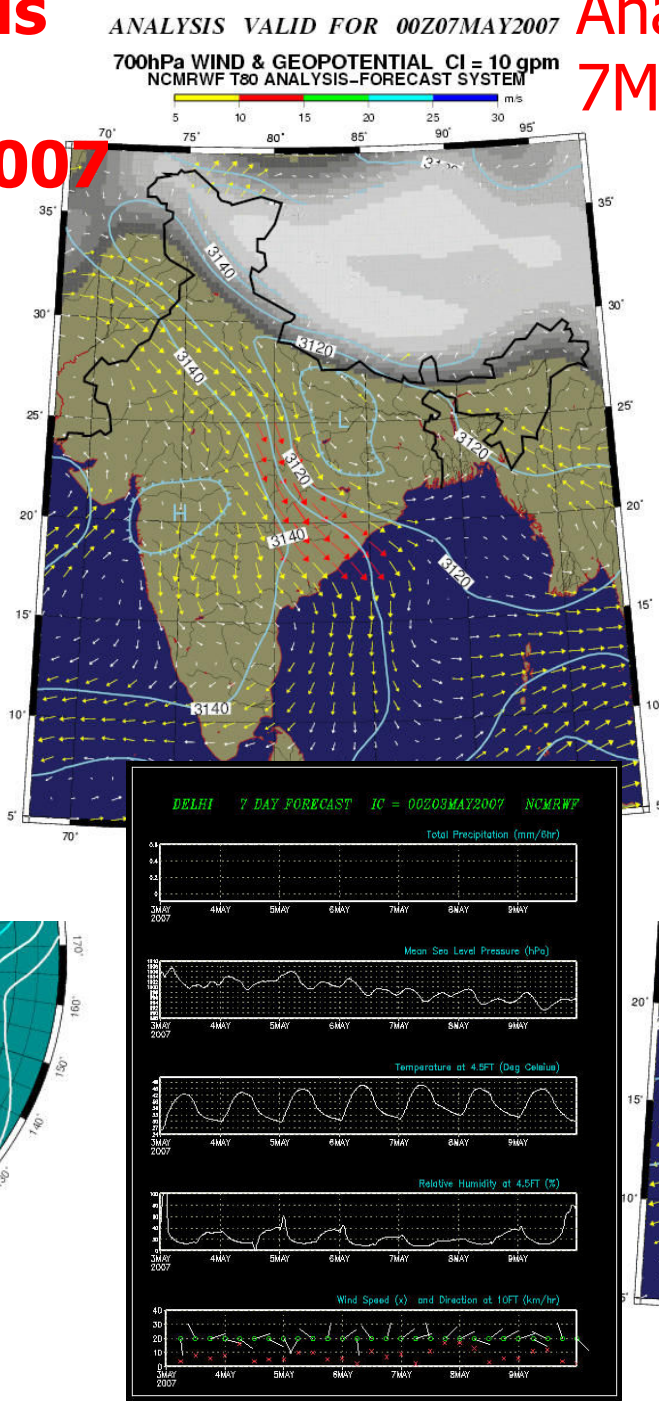

ANATOMY OF THE CHILL
1 In a normal winter, the ridges and troughs keep moving, ensuring normal temperatures
2 This year, a ridge of high pressure was formed over Central Asia. It remained stationary and forced the incoming winds to first rise to a higher latitude with sub-zero temperatures
3 The winds, very cold by now would come down the ridge and flow as if in a funnel all through the Indo-Gangetic plain lowering temperatures substantially.
High pressure ridge over central Asia
4 Since these winds did not pass over the ocean, there was no moisture in them. Hence no winter rain and no fog this year
LOWEST TEMPERATURES
Delhi: 1.9 (Jan 2) Mumbai: 9.4 (Feb 6) Kolkata: 10.8 (Feb 3) Ludhiana: -2 (Jan 24)
The only time Delhi had a colder January was in 1997, 1984, 1971 and 1967.



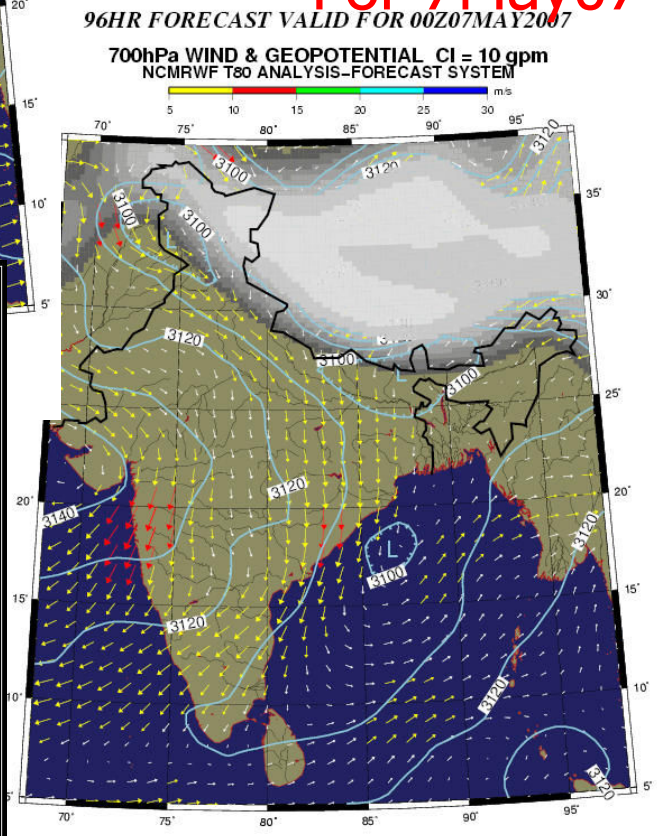
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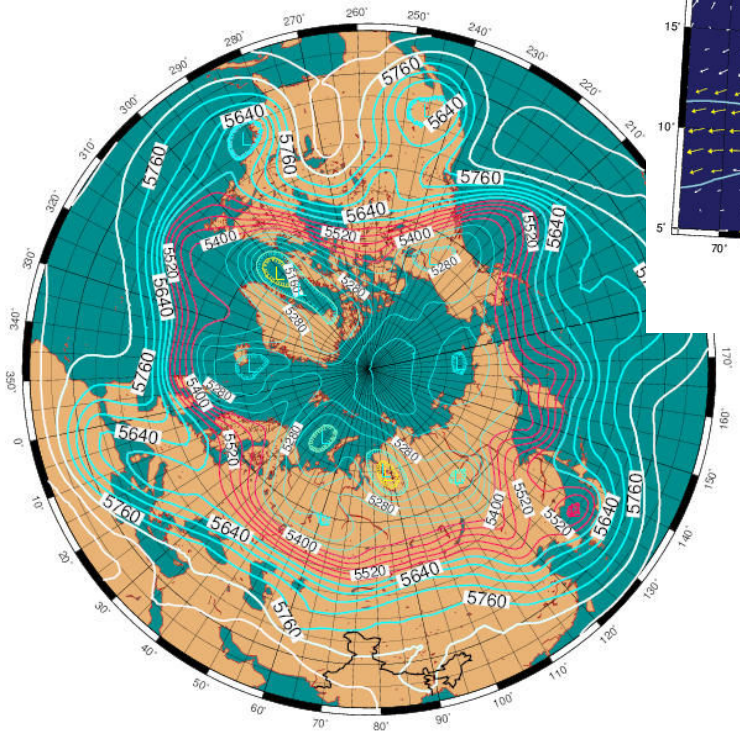
Northwesterly winds Causing heat wave Conditions 7May 2007

Analysis 7May07



Day-4 FC For 7May07





Summary:

- It is observed that West-northwesterly to north-westerly winds are major cause of both the cold waves during winter as well as Heat Waves during Summer

- Mainly weather systems embedded in mid-tropospheric, mid-latitudinal winds namely western disturbances / westerly troughs

- Same West-northwesterly to north-westerly winds which set over north India after passage of a western disturbance/trough cause cold waves in general during Winter;
  do also mainly cause heat waves over north India in summer