# Equatorial ExB drifts during sudden stratospheric warming events

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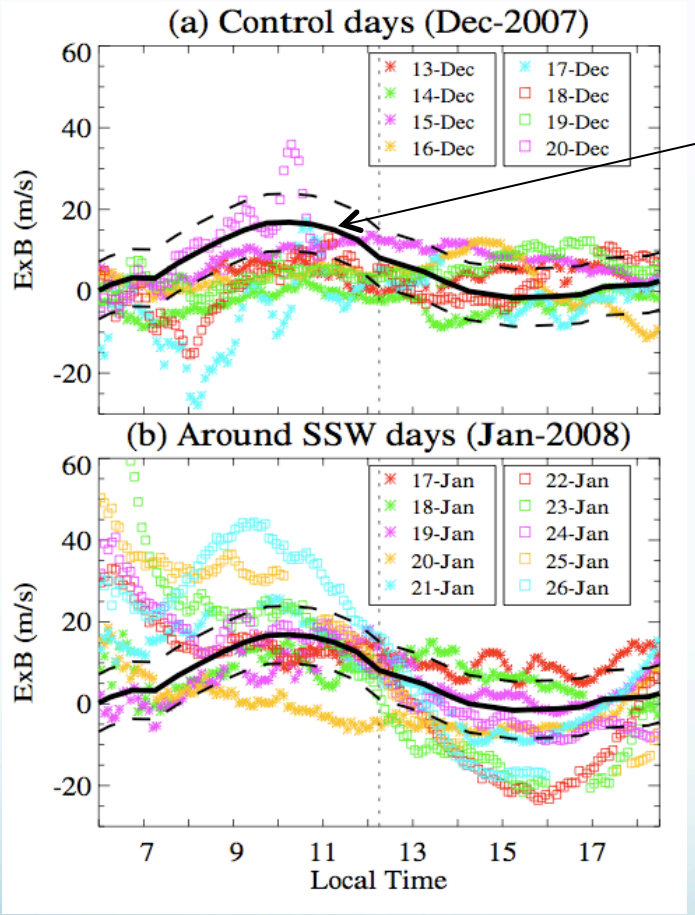
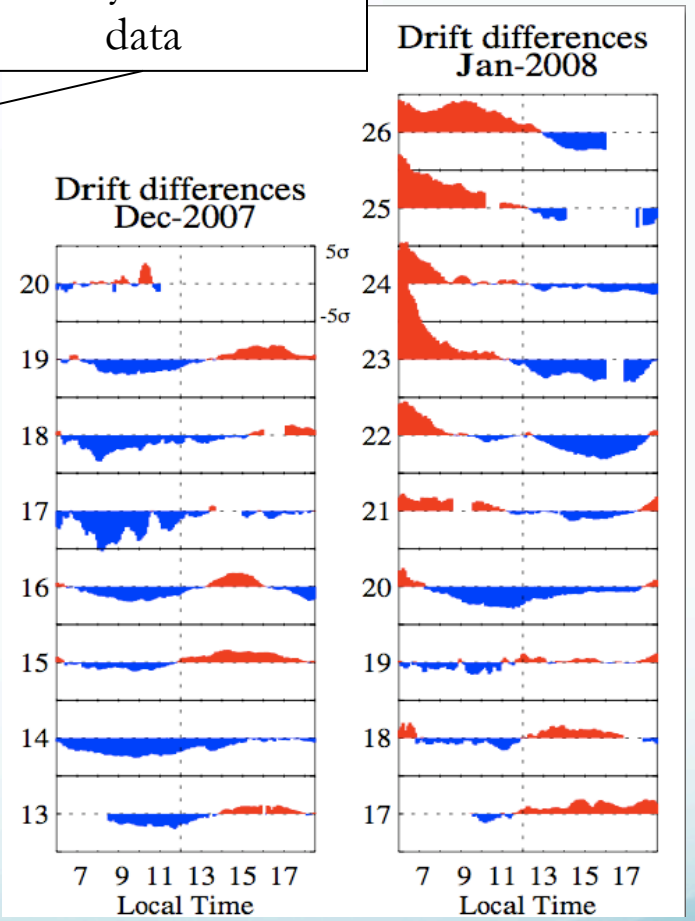
# SSW Jan 2008: ExB Daytime Drifts

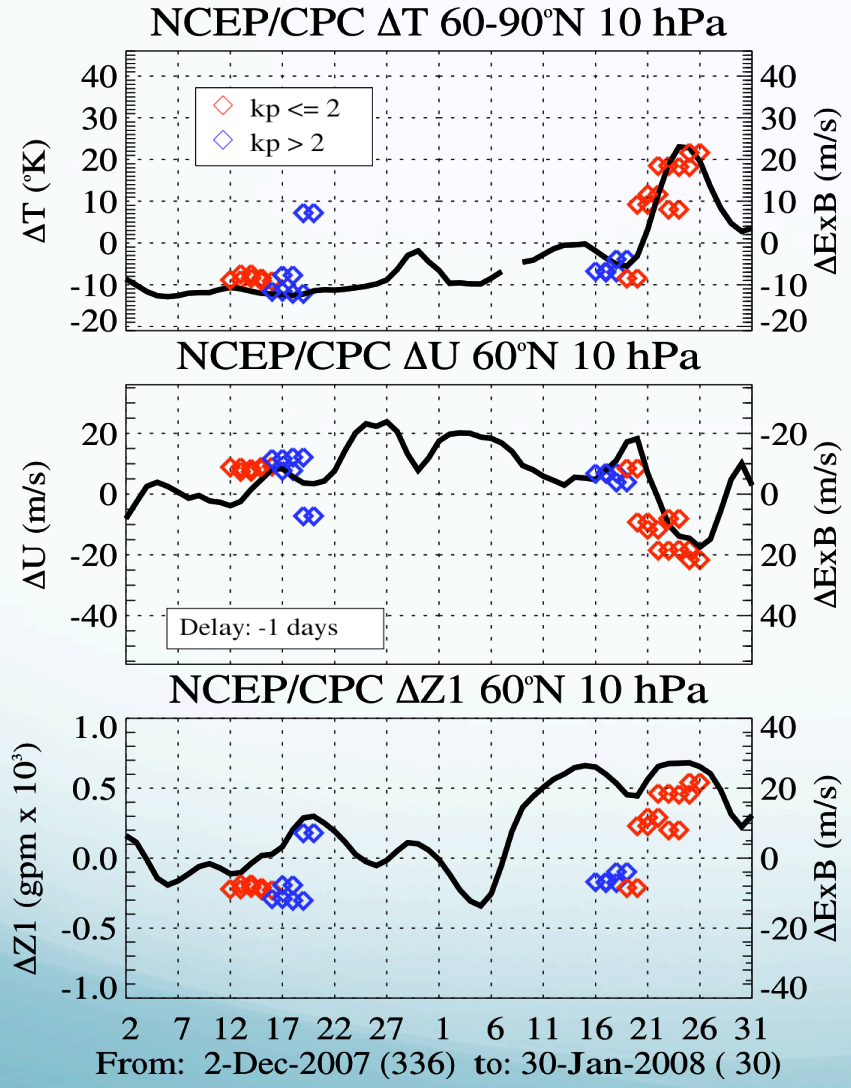
Average + variability from 35 years of ISR data




[from *Chau et al.*, 2009]

# SSW Jan 2008: ΔSSW vs ΔExB

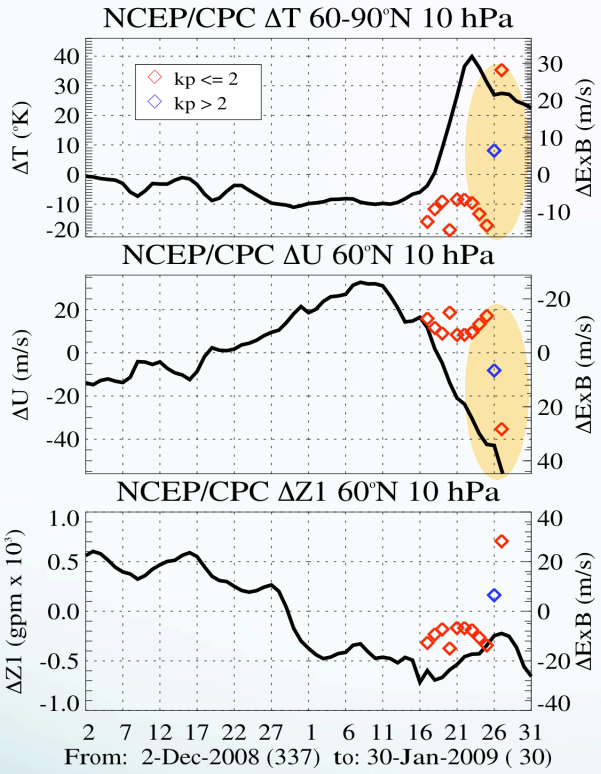



- ΔExB: Morning amplitude ExB difference with respect to expected averages, after fitting a semidiurnal wave.
- ΔSSW: differences with respect to 30-year median values.
- High correlation/anticorrelation: ΔExB vs. ΔT/ΔU during SSW.
- Note the "persistence" of the ExB drift pattern during SSW period.
- Comparing peaks (Highest temperature difference and Highest ExB difference), ExB drift peak occurs ~1 day after SSW temperature peak.

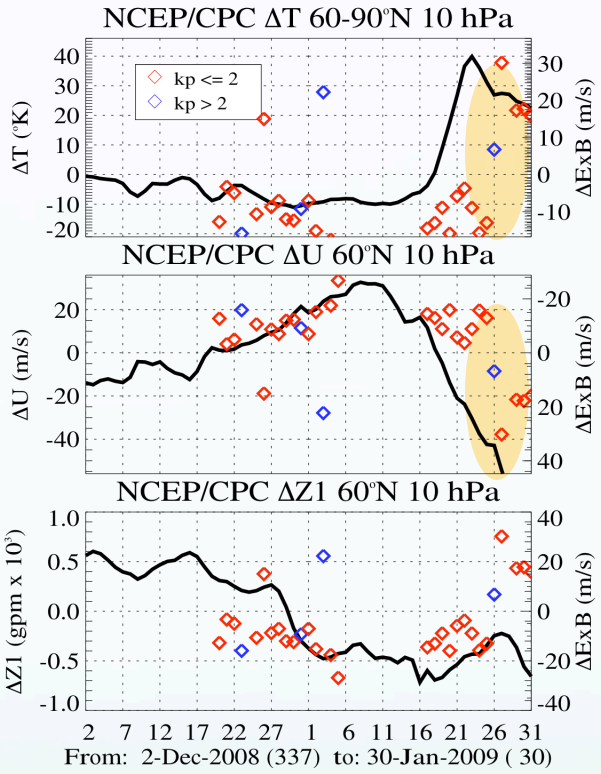
[from *Chau et al.*, 2009]

# Jan 2009: SSW vs Jicamarca Drifts

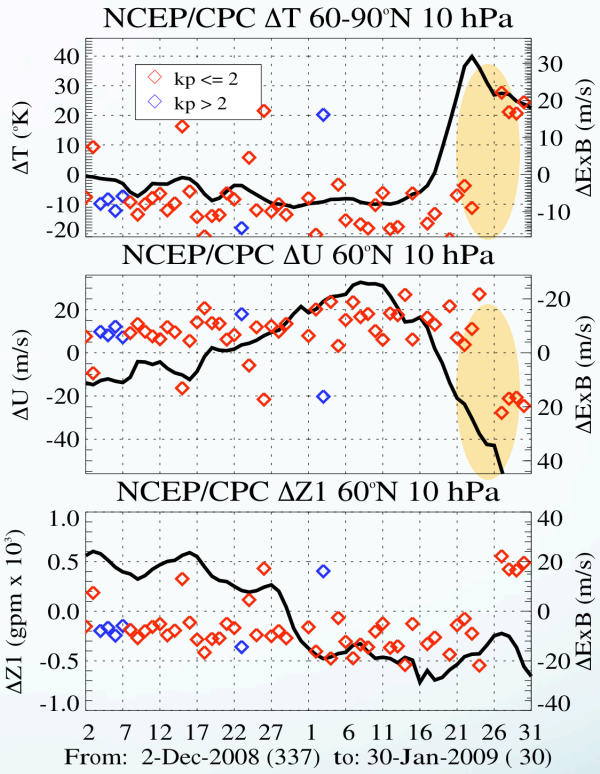
## ISR



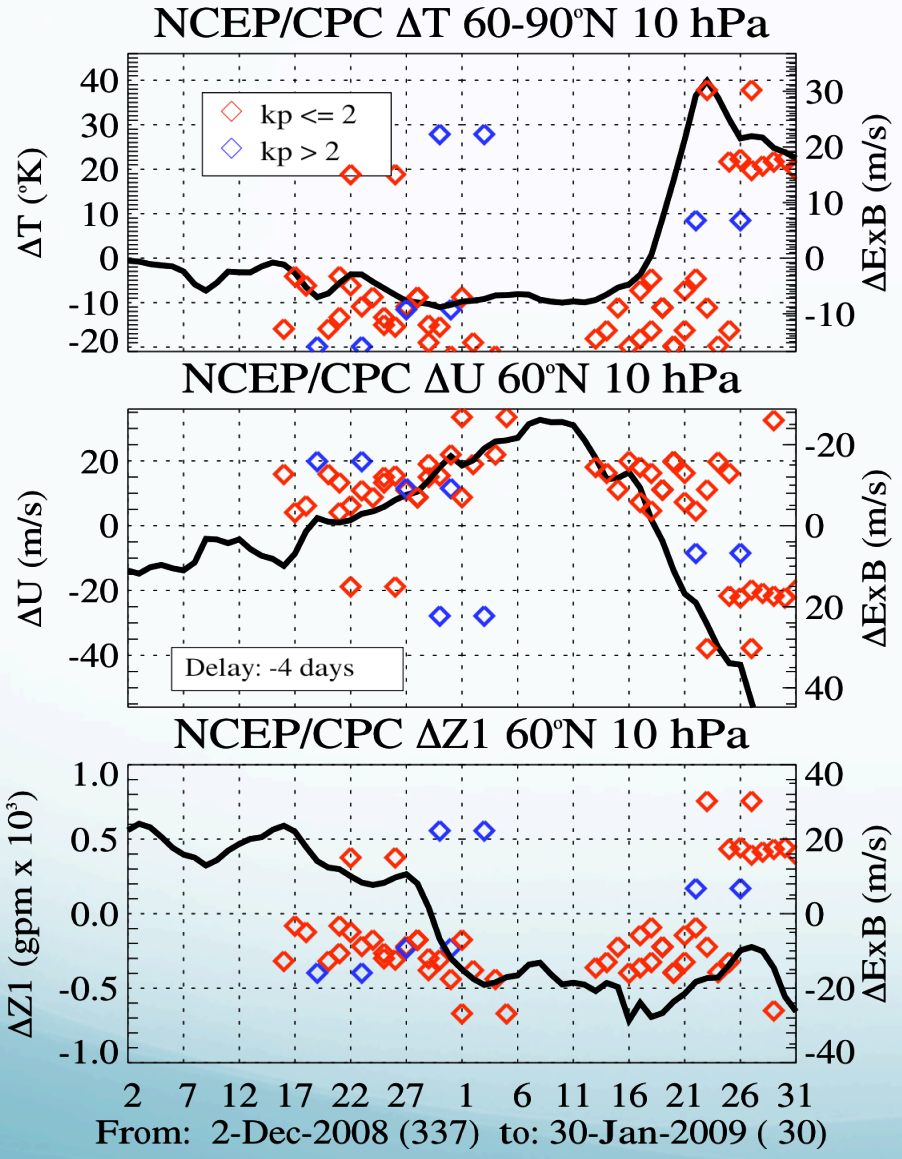

## 150-km




## ΔH

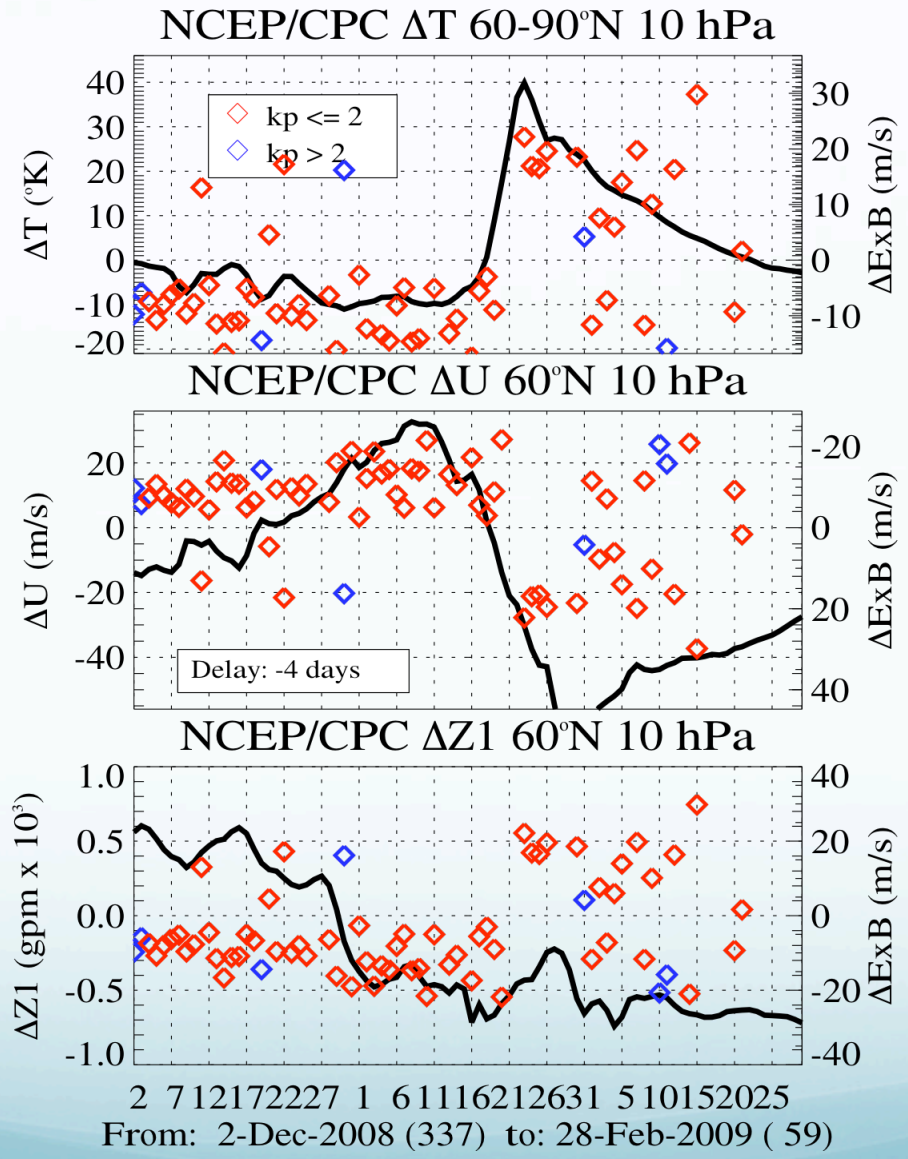


# SSW Jan 2009: ~4 days delay

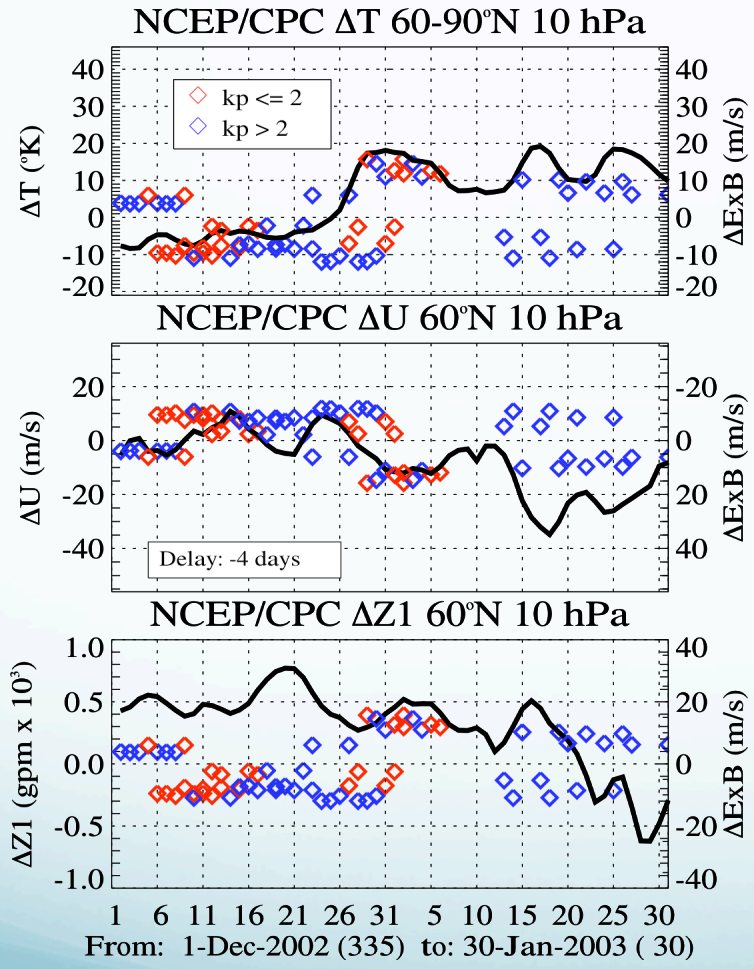



- Again, comparing peaks we find:
  - The highest ExB drift amplitude difference occurs ~4 days after the peak in SSW temperature occurs.
  - Once the highest value is reached, a moderate amplitude persist for few days, in a correspondence with the SSW temperature behavior.

# Jan 2009: 3-month behavior



# Jan 2003: SSW vs. Jicamarca Drifts




- Minor (?) SSW, westerly wind decreased
- Moderate to high solar conditions
- Magnetically quiet and active conditions.
- Semidiurnal pattern between Jan 2-6, showing “persistence”.
- ExB peak difference occurs after ~4-5 days the occurrence of the highest SSW Temp.

# Conclusions

- Based on three campaigns, Jan 2003, Jan 2008 and Jan 2009, it is clear that indeed the equatorial ionosphere behavior is closely correlated to the occurrence of SSW events, specifically:
  - The morning ExB drift differences are amplified more than 3 times the expected standard deviations
  - Such behavior persists for many days in close association with the duration of the stratospheric warming and the reversal of the zonal wind.
  - The peak of the equatorial disturbances occurs between 1 to 5 days after the peak of high-latitude temperature at 10 hPa level. At lower levels the temperature increase later as the event propagates downward
  - During the Jan 2009, the SSW lasted unusually long time and the associated ExB amplitudes differences were predominantly larger than previous to the SSW event.

# ISR ExB: Jan-2009