

Climatology of mean fields
and tides of the mesopause
region temperature and wind
observed by Na lidar in
Colorado

Tao Yuan

Physics Department

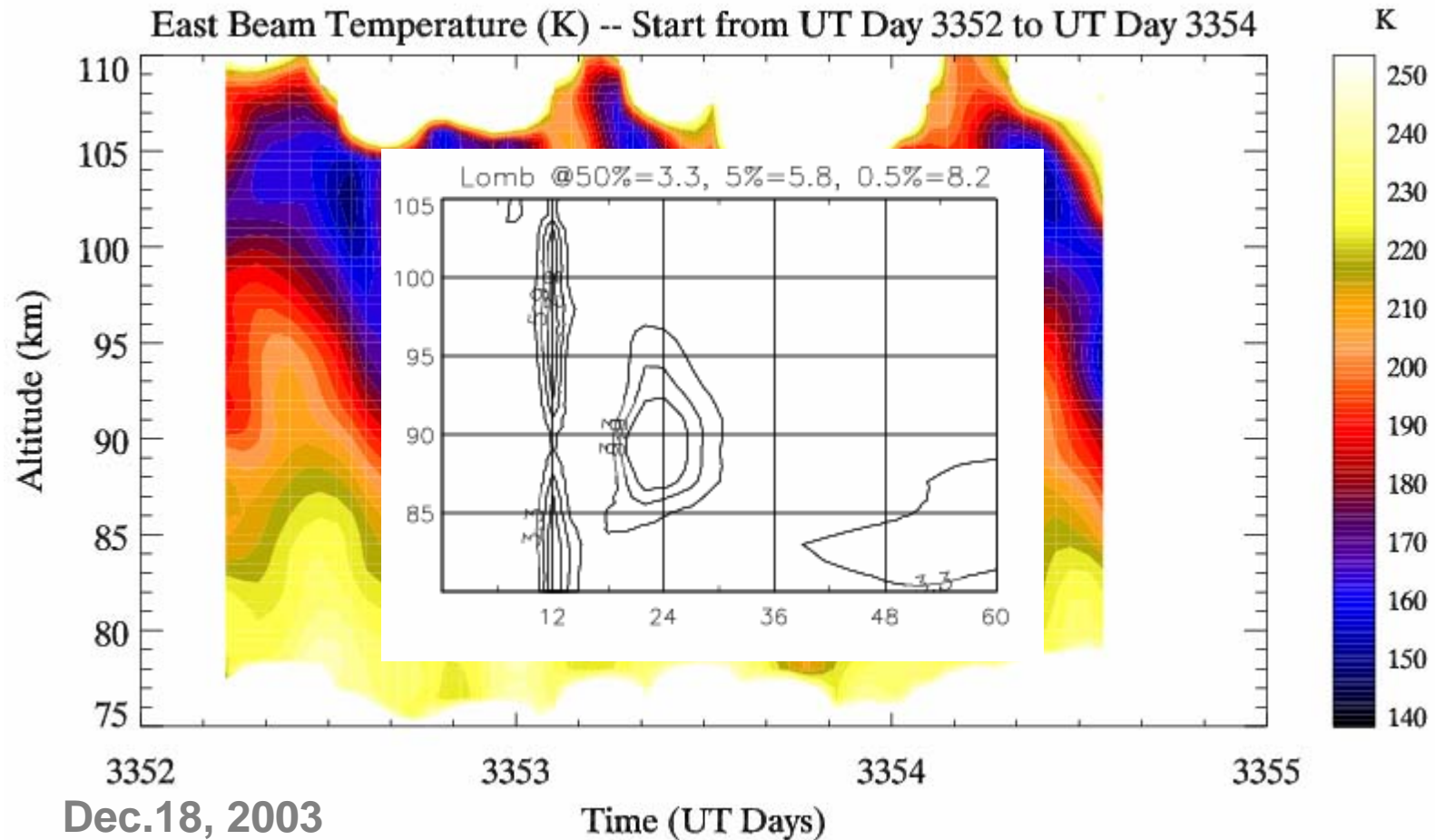
Colorado State University

Supported by
NSF/CEDAR&
NASA/TIMED

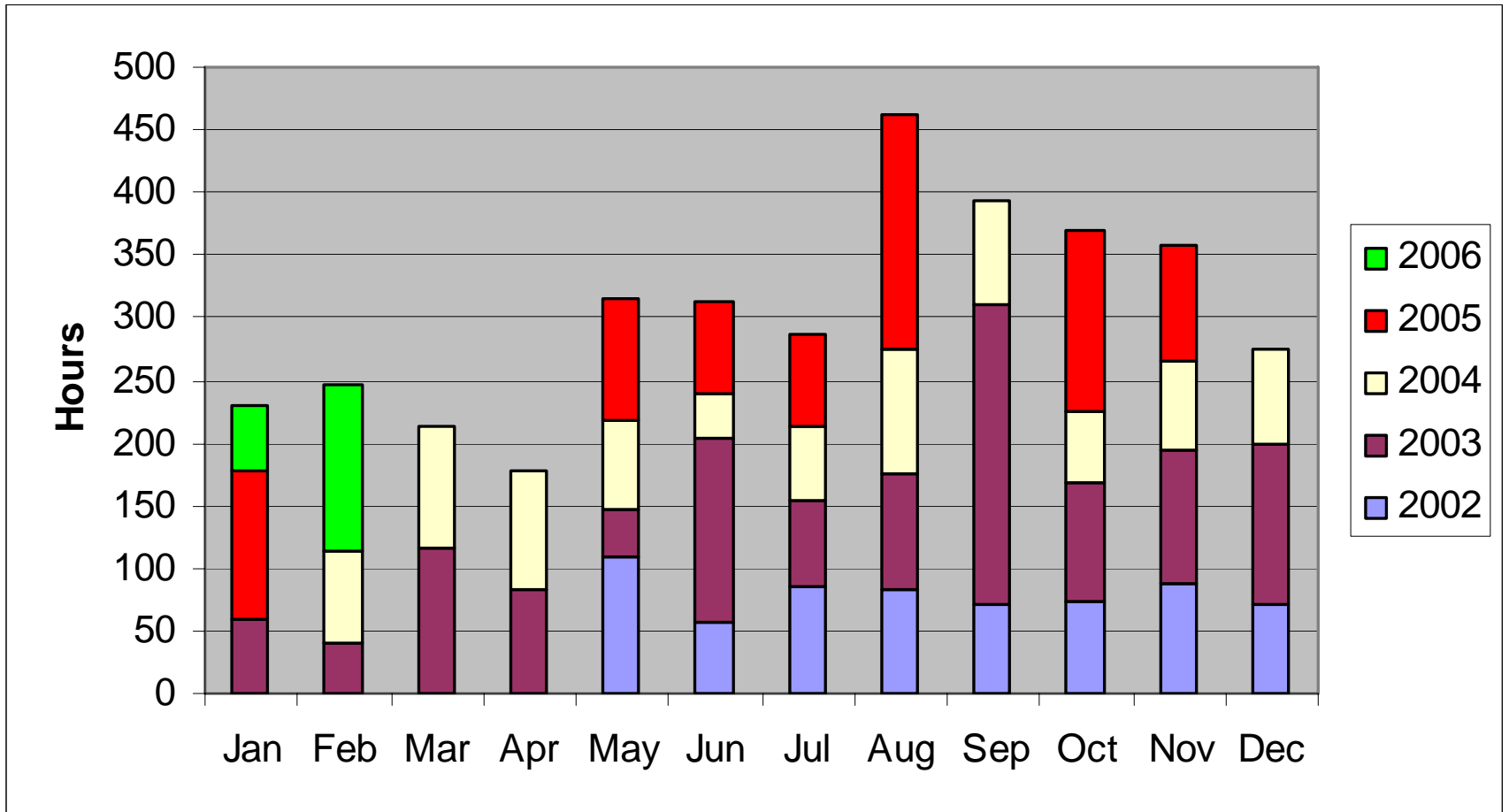
Outline

- CSU Na lidar data distribution and statistics
- Diurnal-cycle measurements of the monthly-mean temperature and horizontal winds
- Seasonal variations of diurnal and semidiurnal tides
- Summary

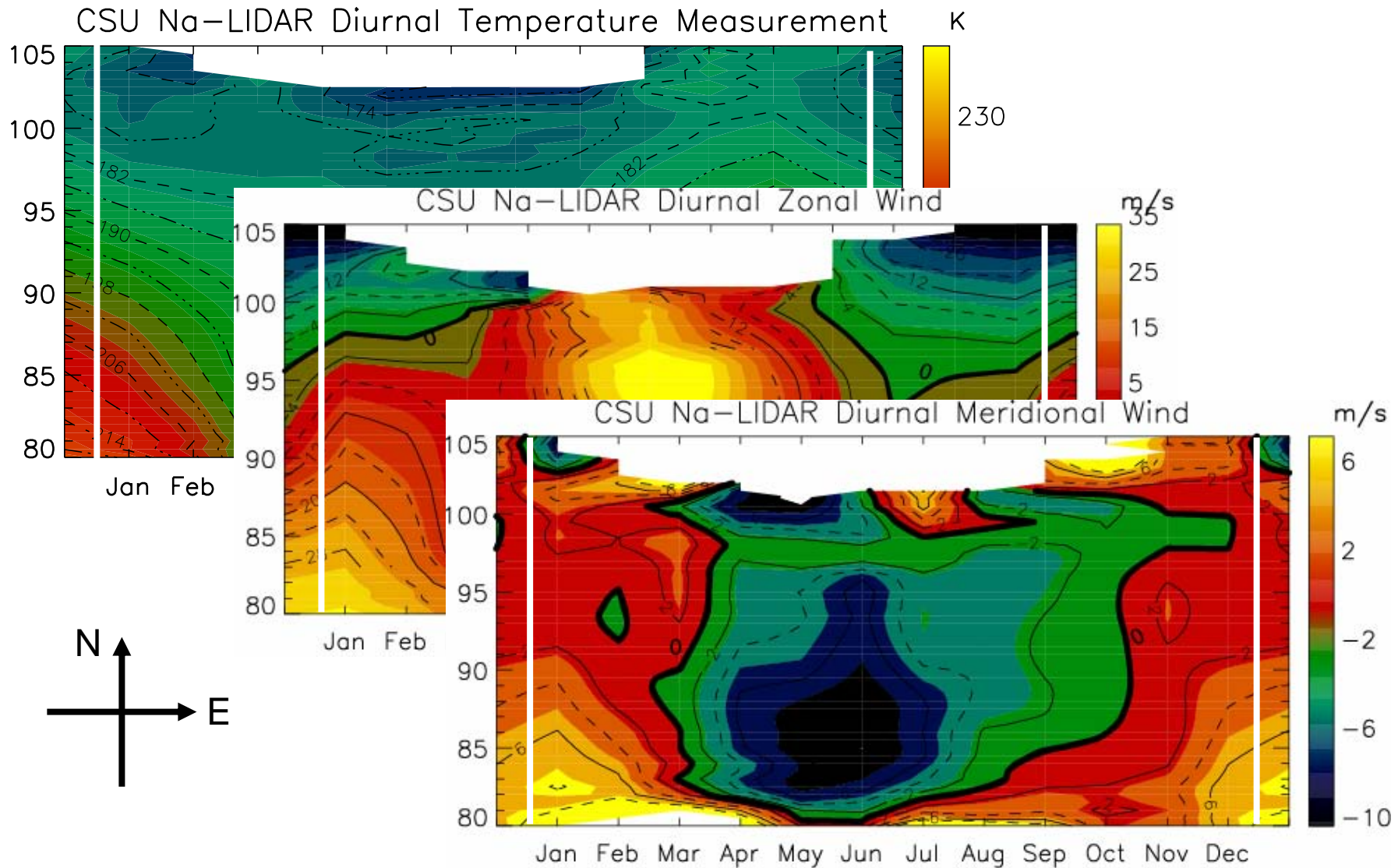
Example of diurnal-cycle observation



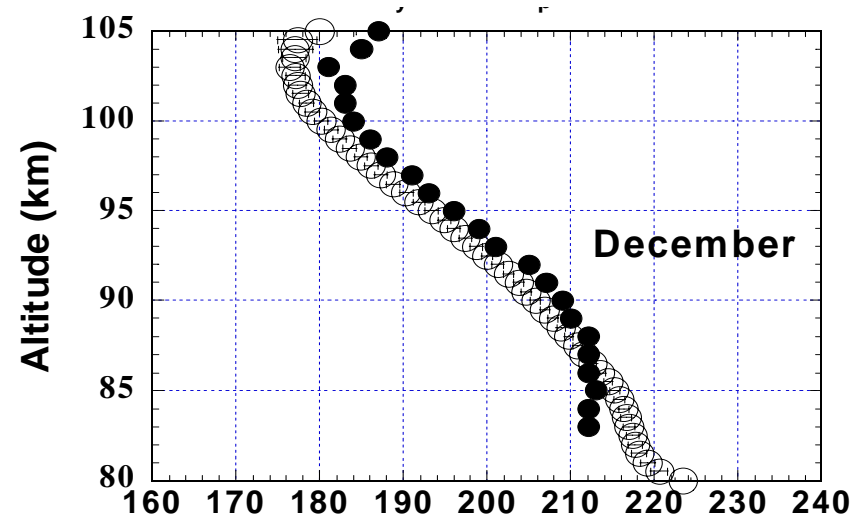
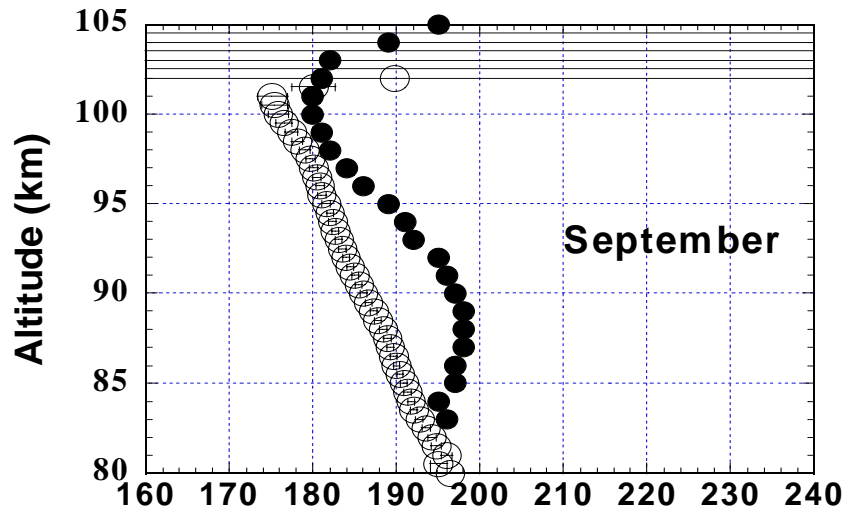
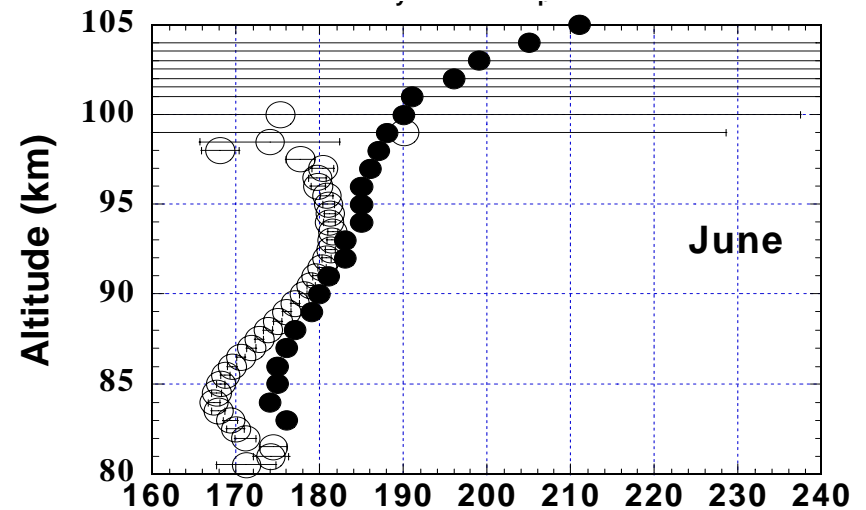
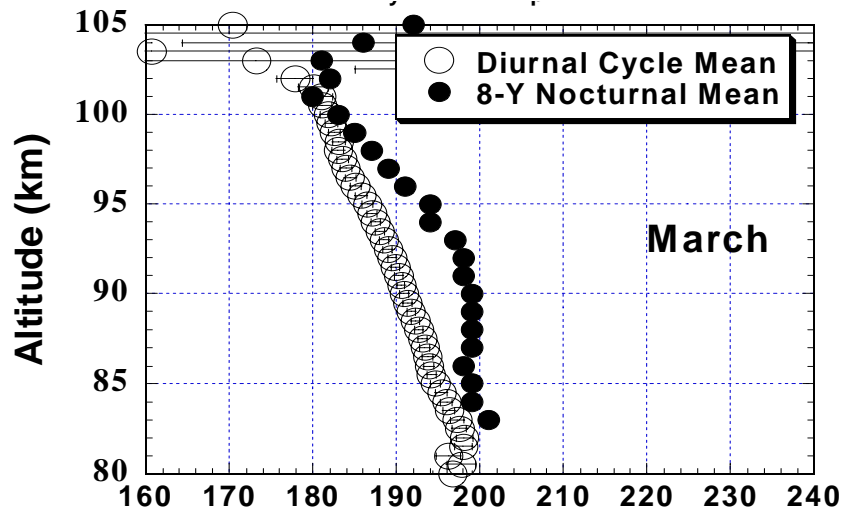
Diurnal data distribution



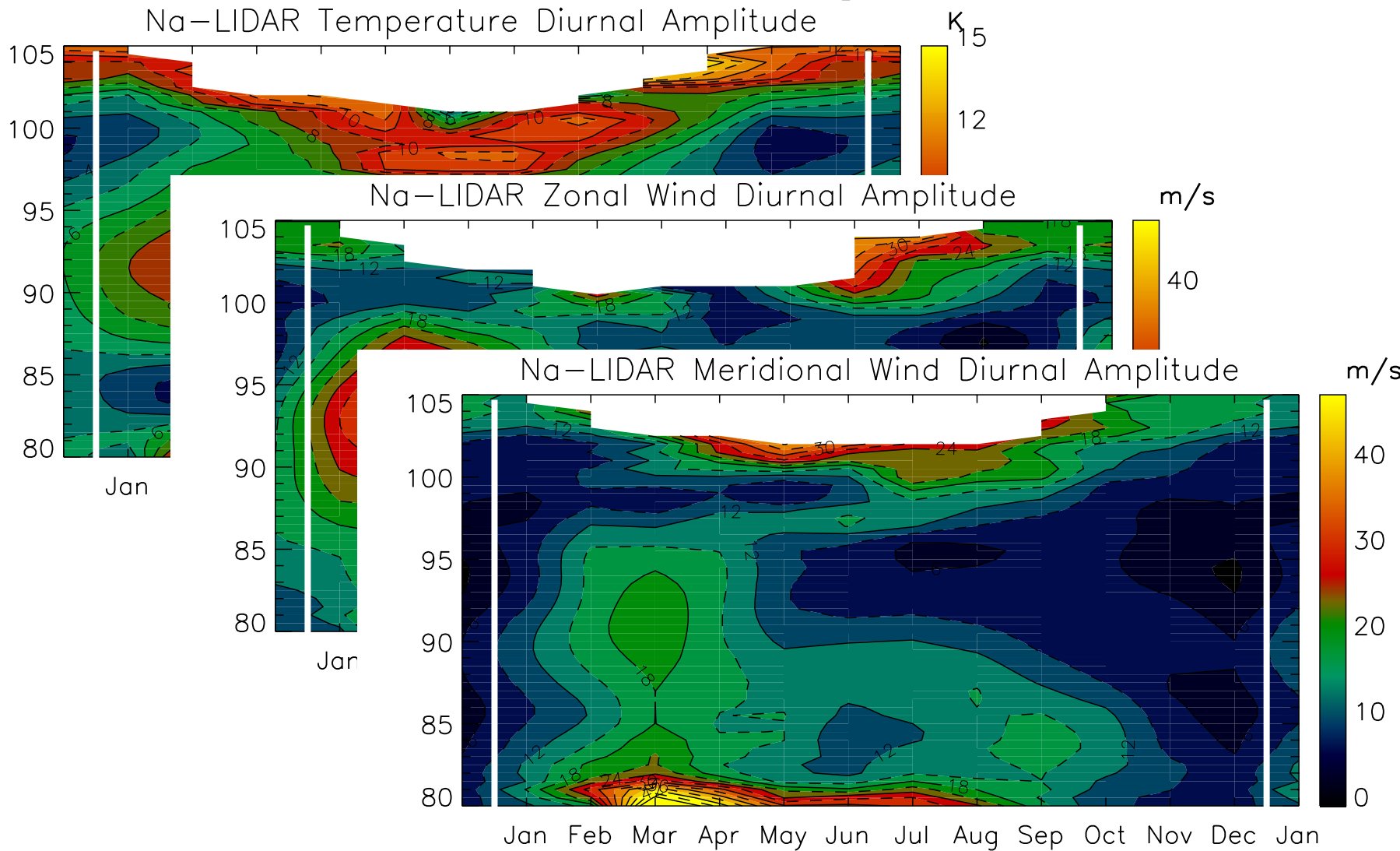
Seasonal variation of diurnal means



Diurnal & nocturnal temperature

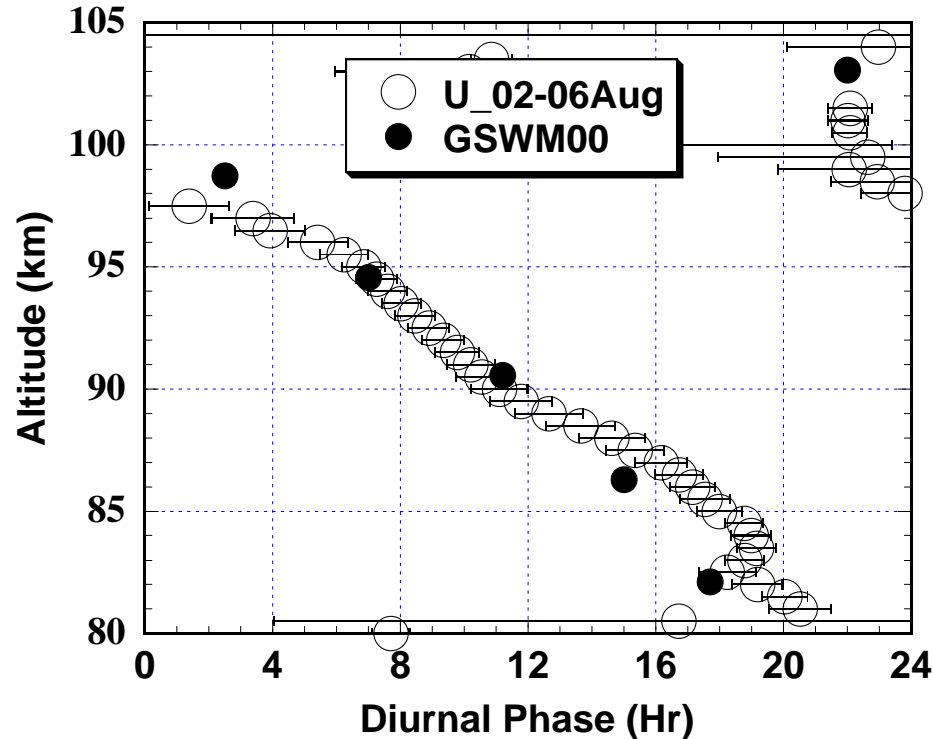


Diurnal tidal amplitude



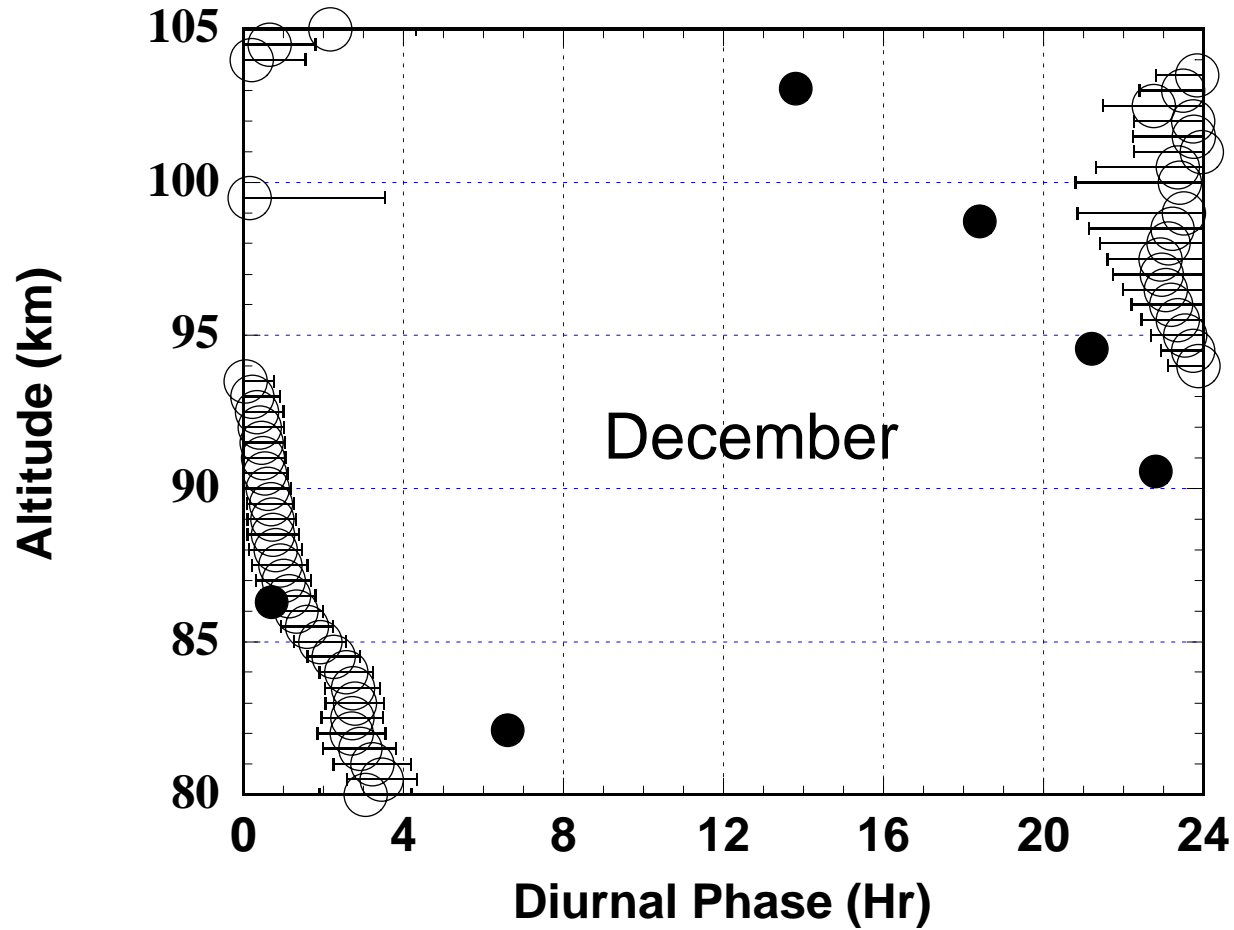
Diurnal phase

Zonal Wind Diurnal Phase

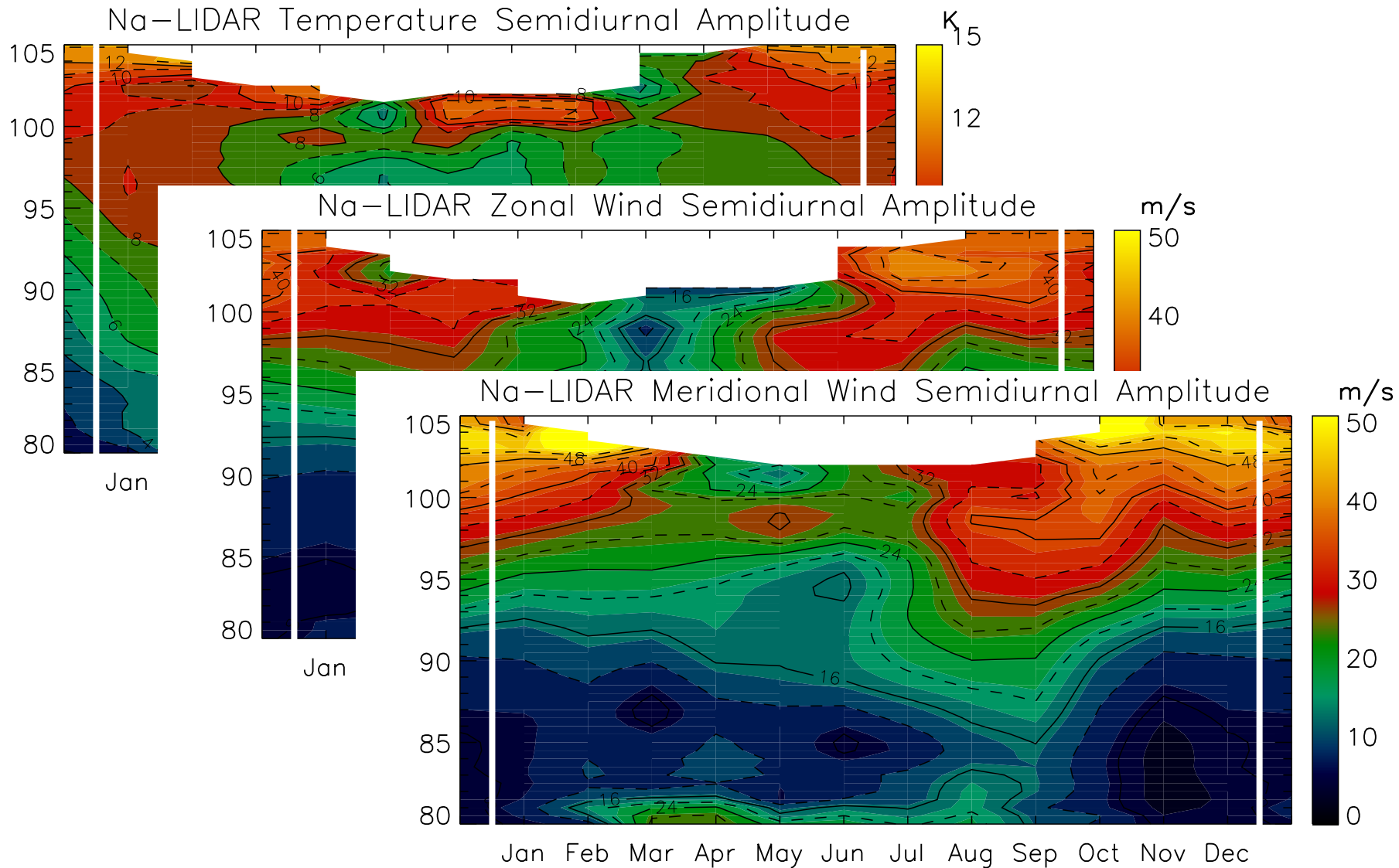


- Propagating mode dominance
- Downward progression, vertical wavelength is 20-25 km
- GSWM00 model agrees with data

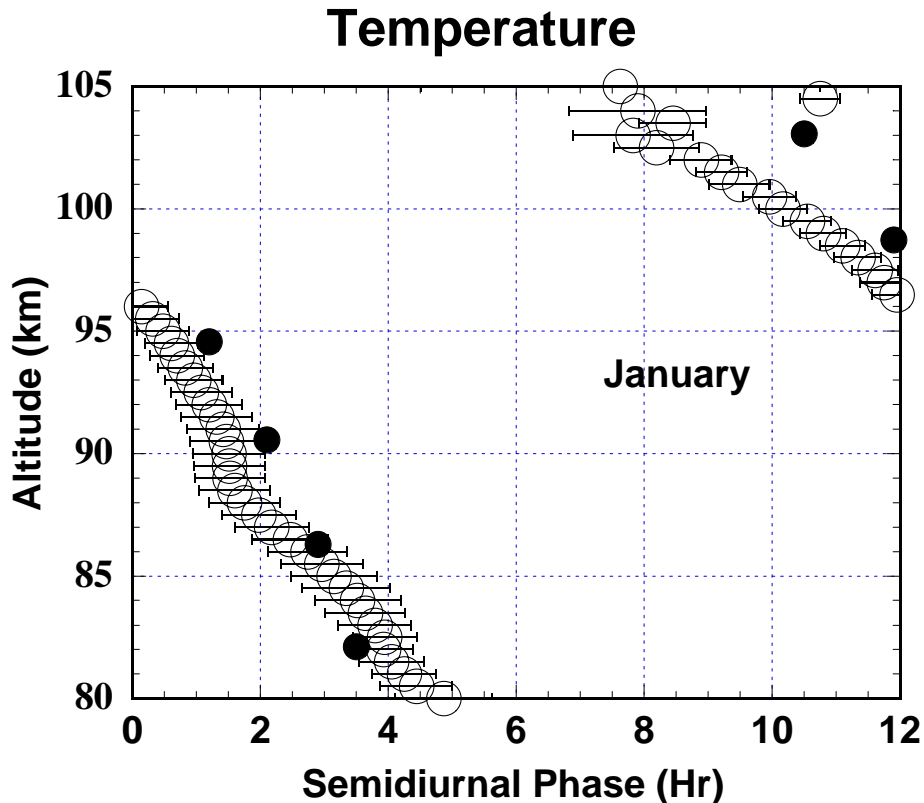
Temperature diurnal phase



Semidiurnal tidal amplitude



Semidiurnal phase



- Propagating mode dominance
- Downward progression, vertical wavelength is 50-60km
- GSWM00 model agrees with data

Summary

- CSU Na lidar diurnal-cycle measurements have accumulated sufficient data for climatology studies of mean temperature and wind fields as well as tides.
- The mean fields captured the expected seasonal variations.
- Diurnal amplitudes reach maximum around 90 km in Feb-Mar. A secondary and smaller peak appears in Sep-Oct.
- Semidiurnal amplitudes are generally stronger than diurnal ones and reach their peaks in winter months.
- The observed fall enhancement in semidiurnal tides and midnight warming in winter are intriguing. Further studies are needed.