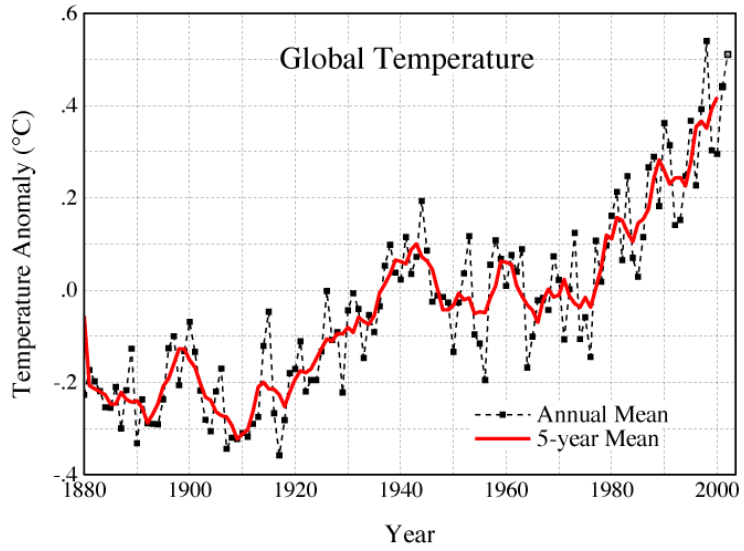


Lightning and Climate – the Water Vapor Connection

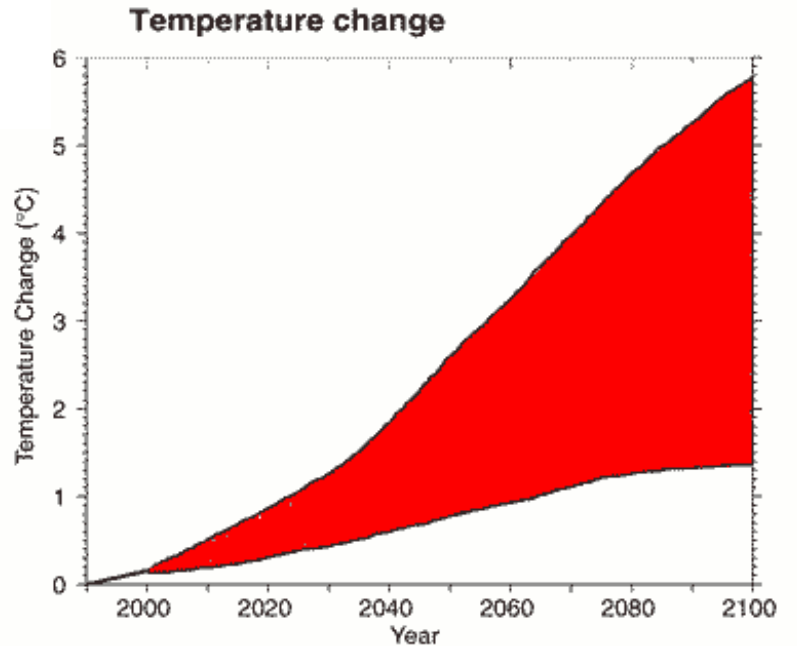
Colin Price and Mustafa Asfur

Department of Geophysics & Planetary Sciences
Tel Aviv University

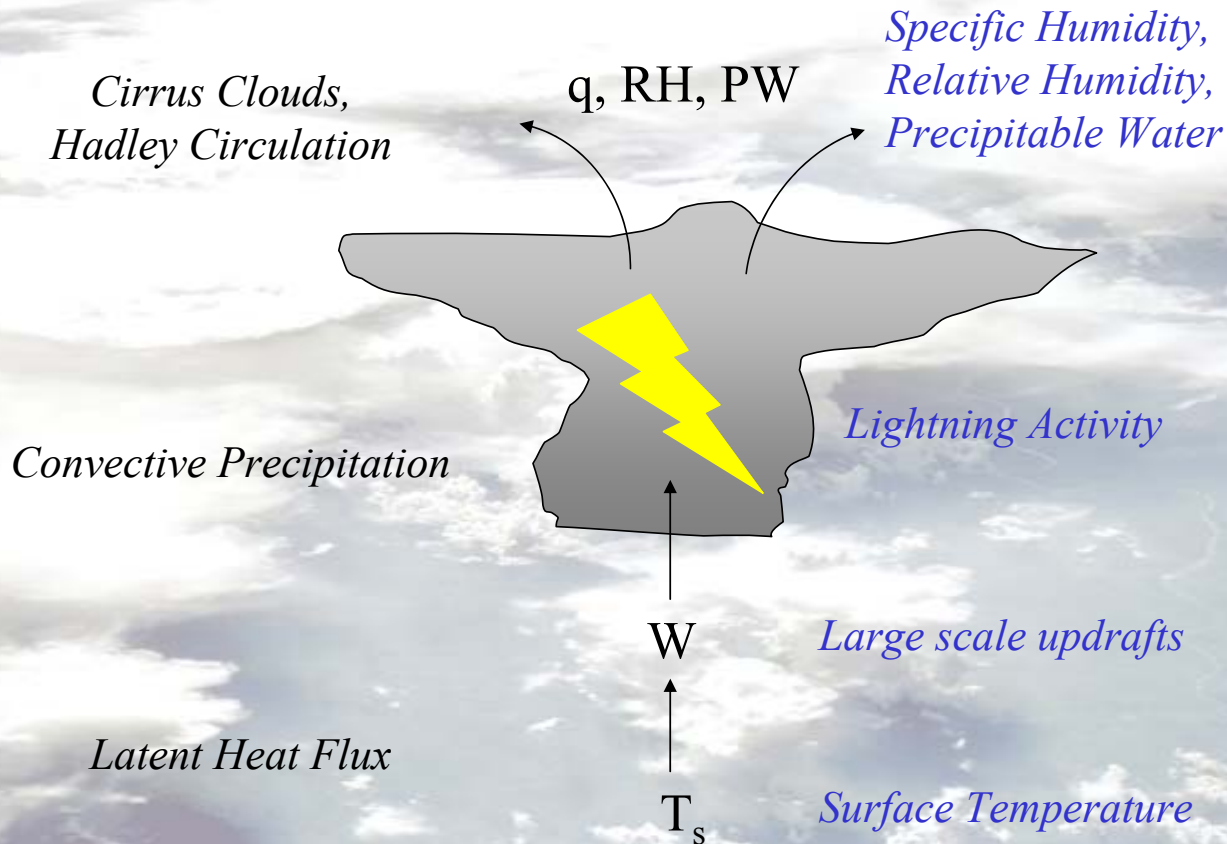
cprice@flash.tau.ac.il

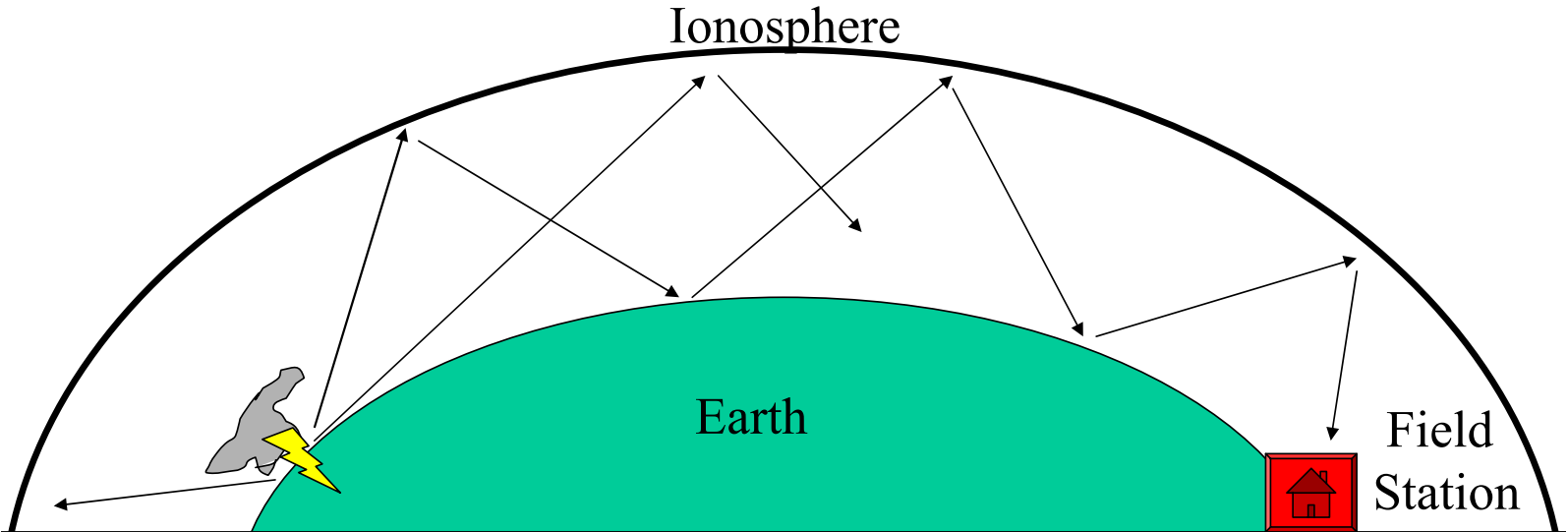
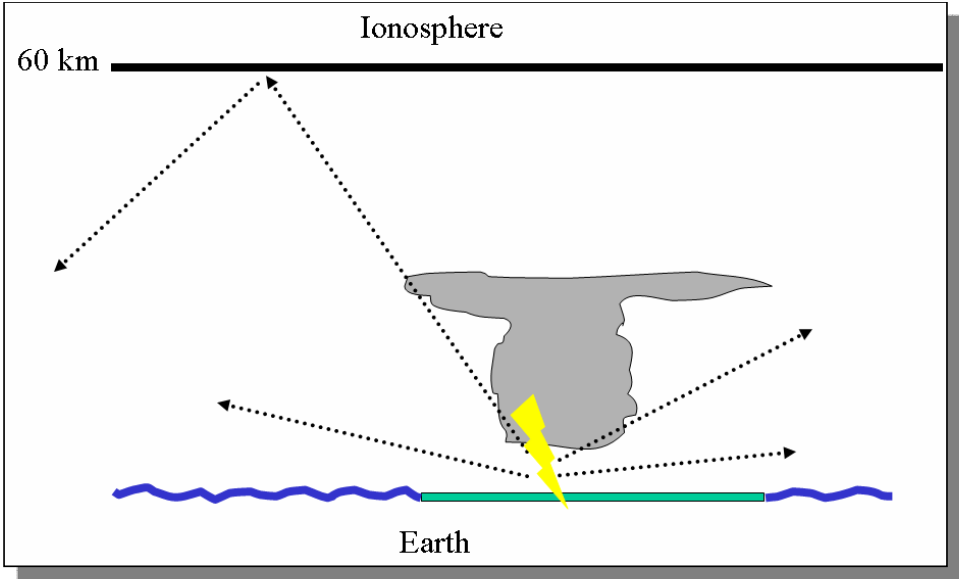


IPCC TAR (2001)



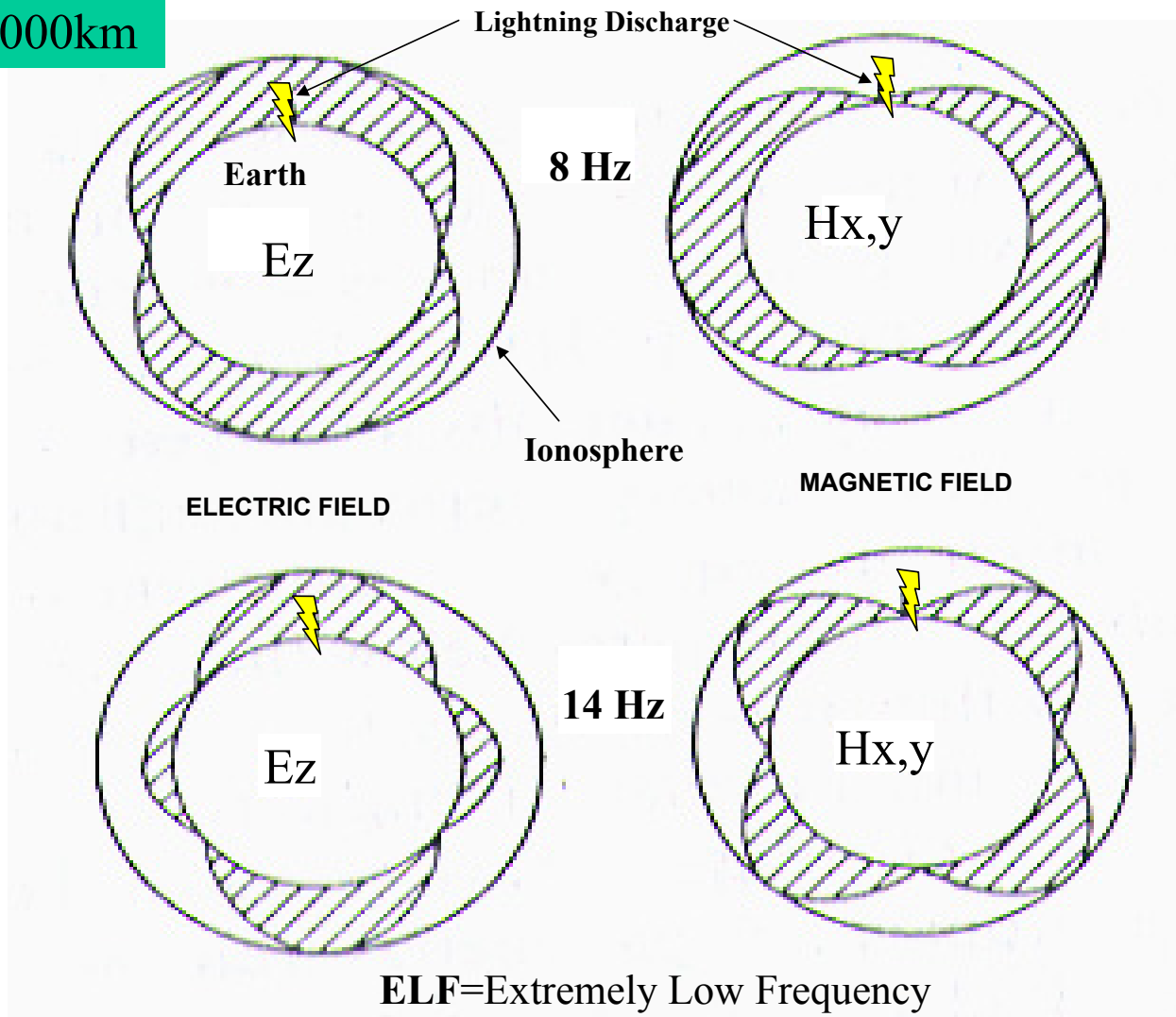
Lightning Relationship to Climate Parameters





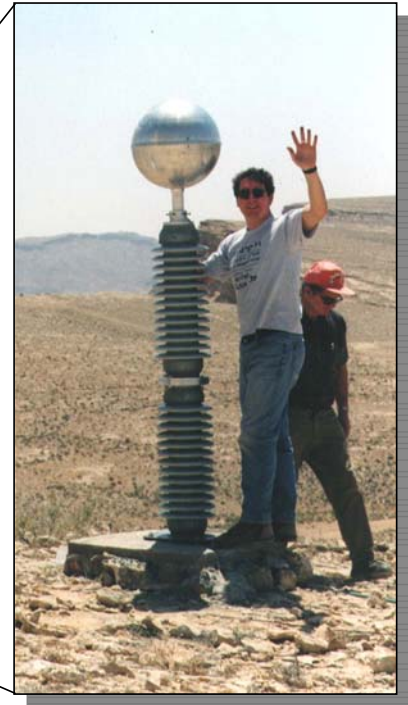
$$F \sim \frac{nc}{40,000\text{km}}$$

Schumann Resonance Modes 1 and 2





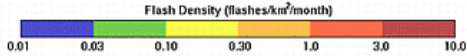
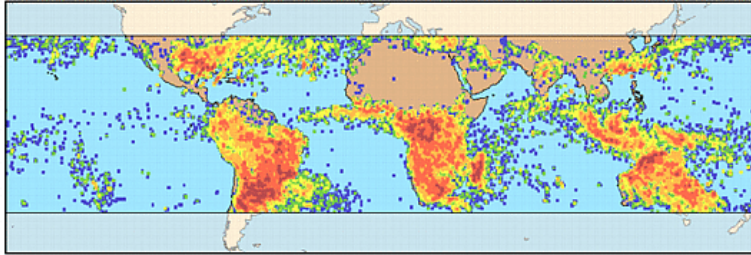
ELF Station
Mitzpe Ramon
Negev Desert
Israel



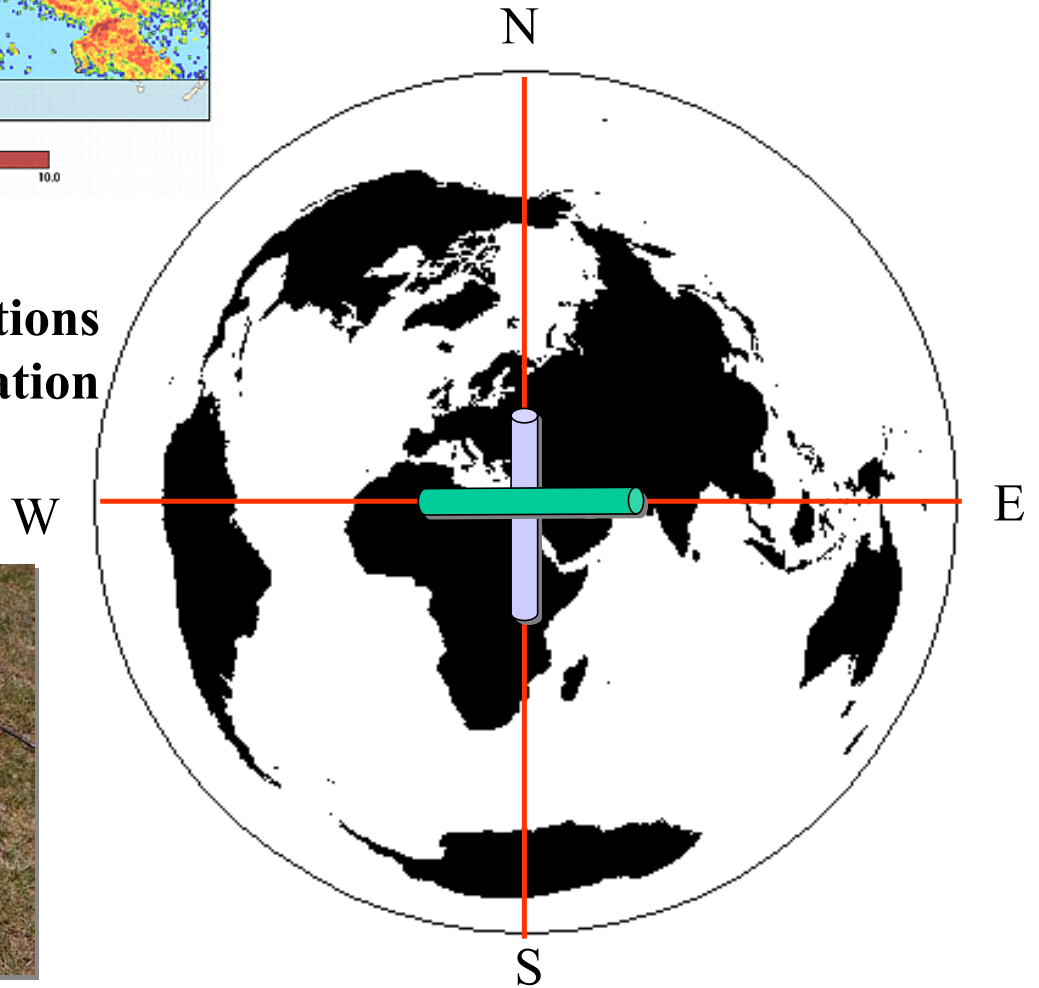


Magnetic Field detectors

Seasonal Lightning Summary
December 1997, January 1998, and February 1998

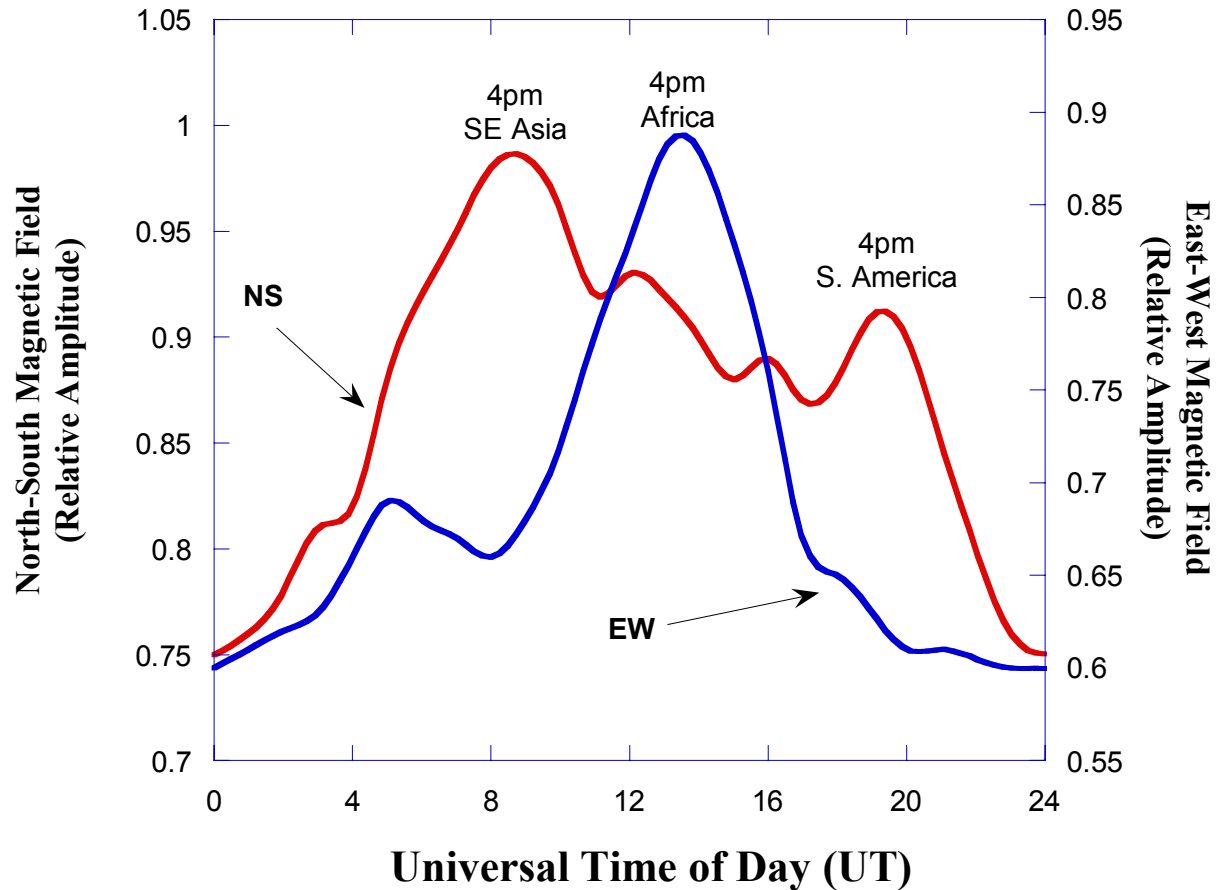


Great Circle Directions Relative to Israel SR station

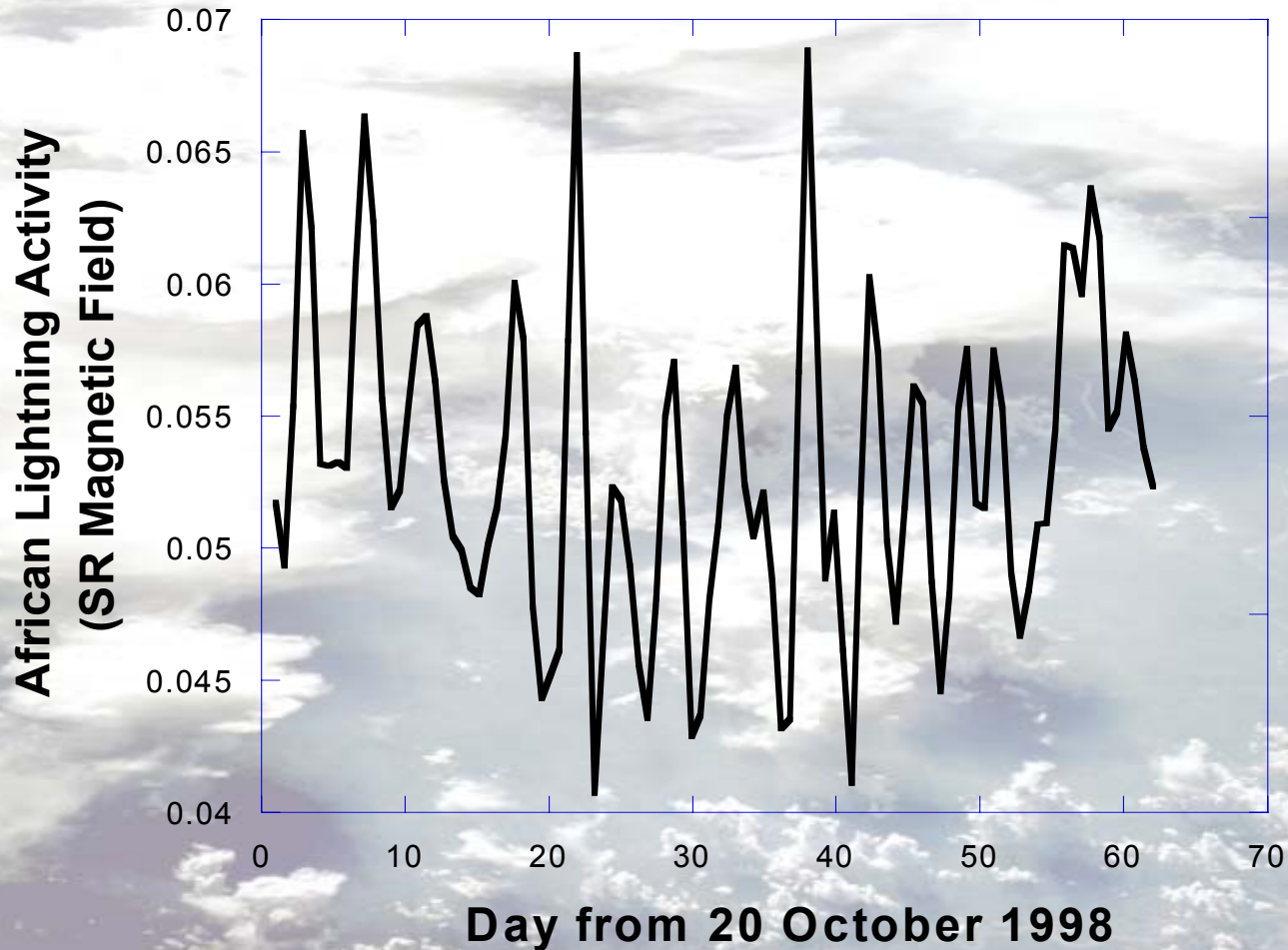


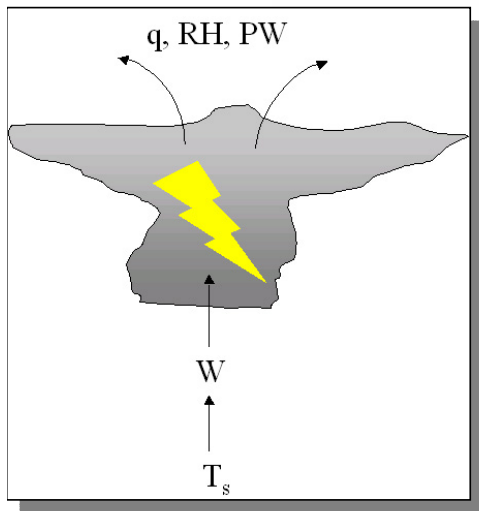
Magnetic Field
Sensor for SR

Diurnal Variations of the SR Magnetic Signals Observed at Israel Site



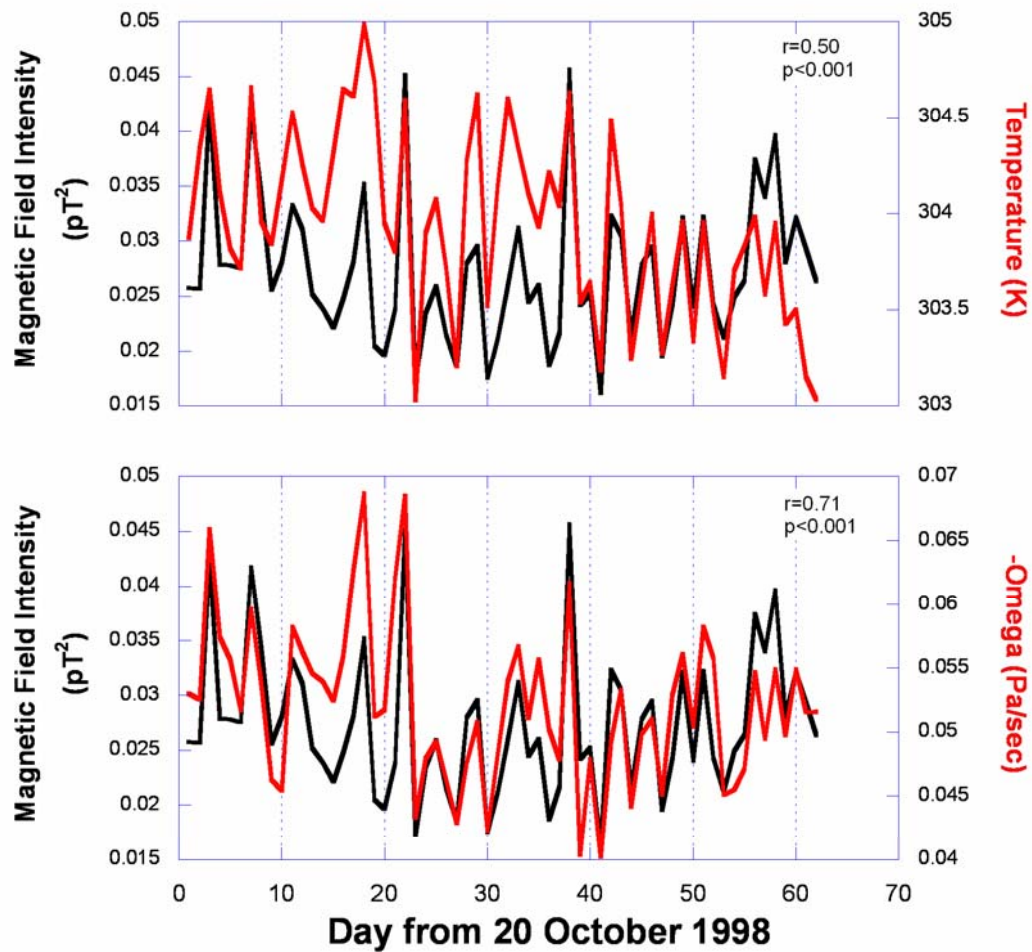
Daily Variability of Lightning Activity in Africa
Daily Variation of the EW Magnetic Field at 12UT
20 Oct – 20 Dec 1998

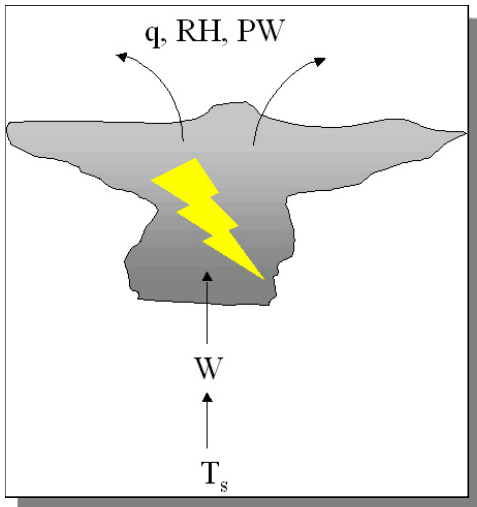




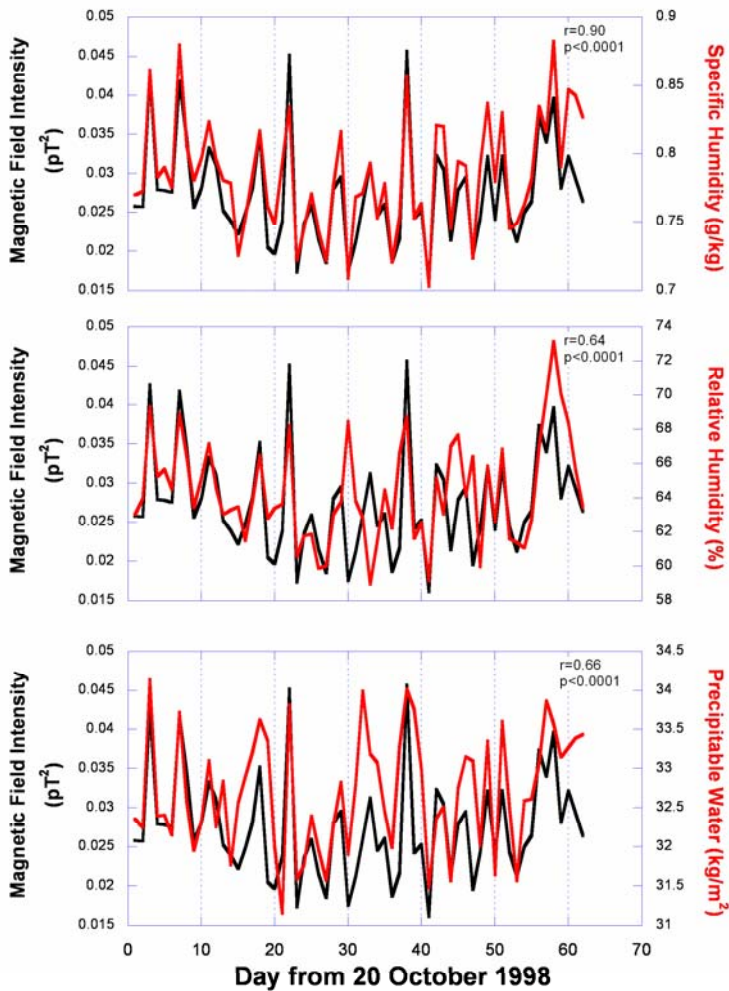
Climate Data from
NCEP/NCAR Reanalysis

Time lag between plots = 6 hours



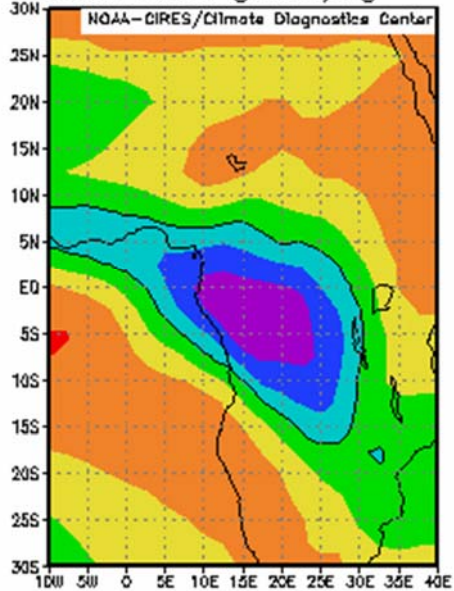


Time lag between plots = 24 hours

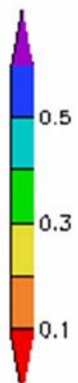


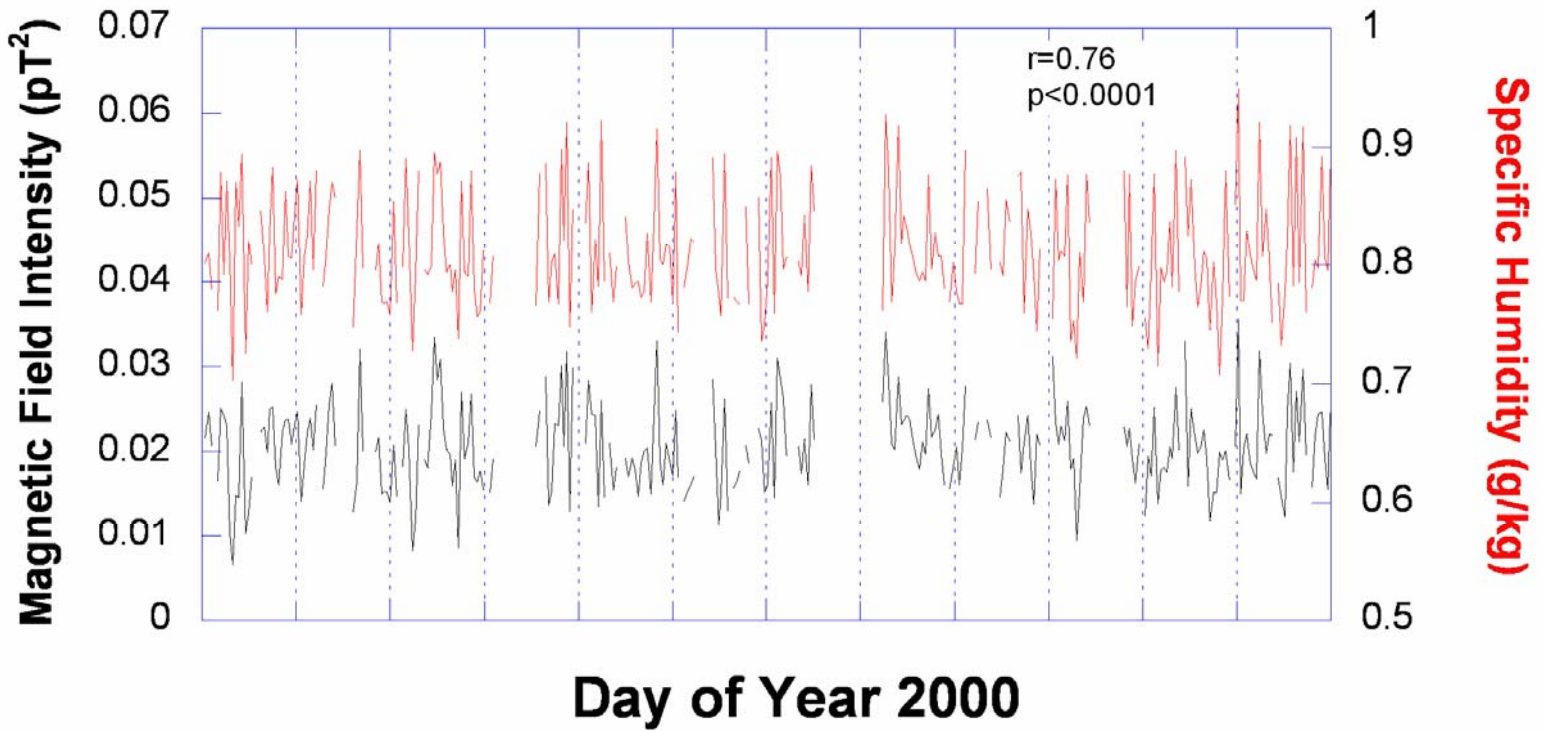
t: averaged over Oct 1998 to Dec 1998

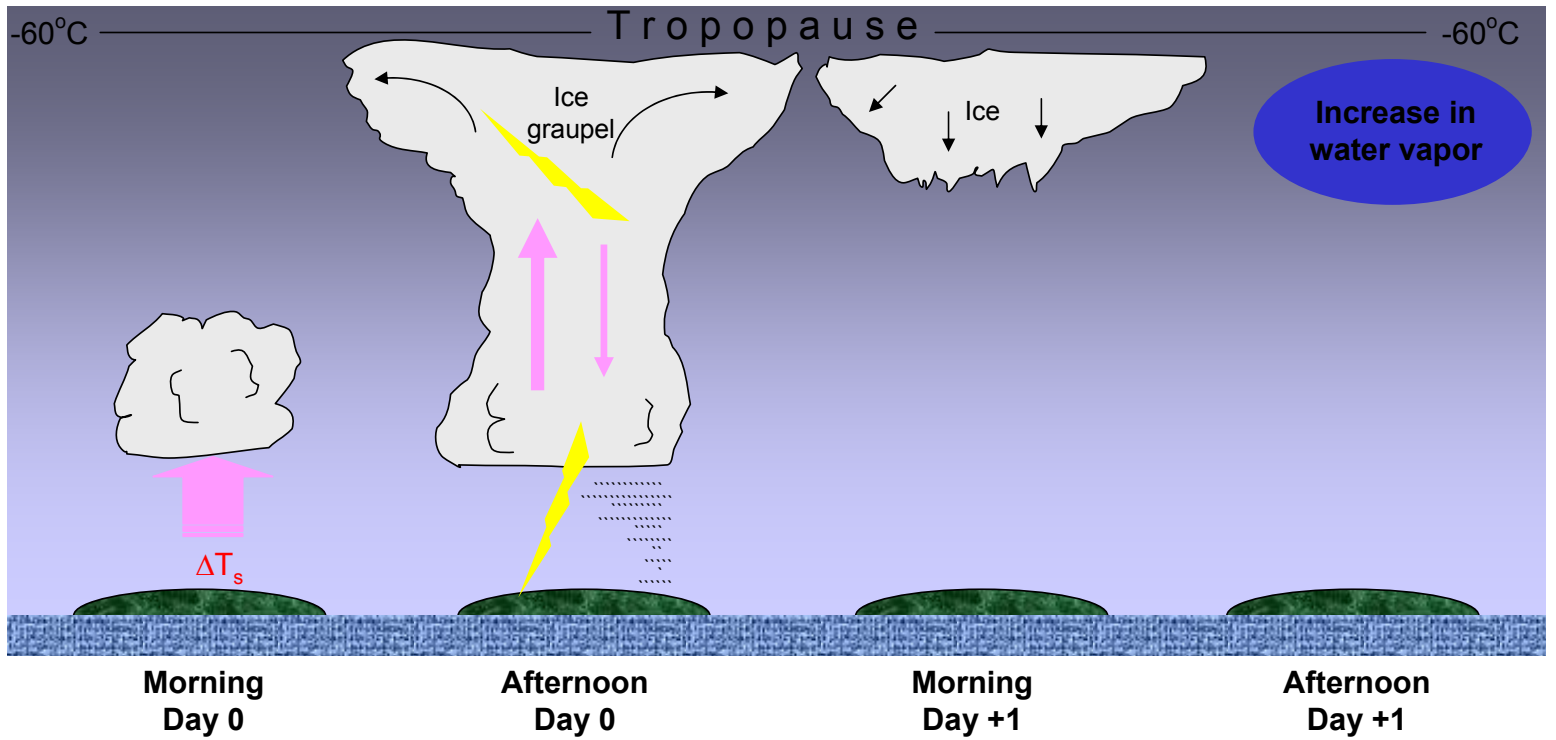
Mean shum grams/kg



300mb specific humidity (g/kg)







Summary and Conclusions

- ✓ Regional lightning activity can be continuously, inexpensively and reliably monitored via the Schumann resonance (SR), over periods from days to decades.
- ✓ Tropical lightning activity is closely related to regional continental climatic parameters related to convection: surface temperature, large scale updrafts, and upper tropospheric water vapor

Price, C., and M. Asfur, 2006: Can lightning observations be used as an Indicator of upper tropospheric water vapor variability, *Bull. Amer. Met. Soc.*, March 2006.