Active Region Time Scales: *solar sources**

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*This is the view from the TSI breakthroughs of the 1980s; see also LaBonte et al. (eds.) NASA CP-2310

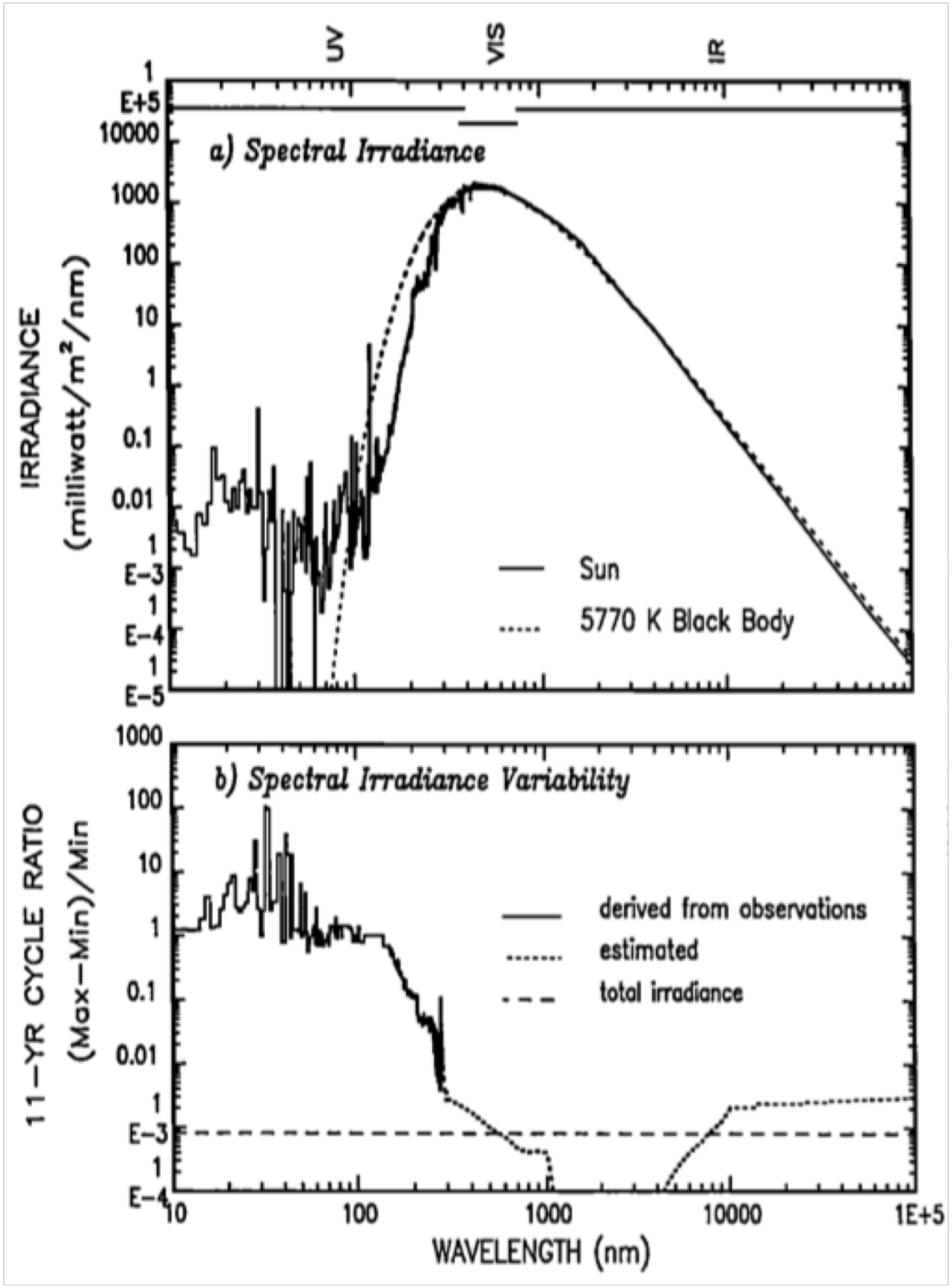
Ancient history

- Precise measurements of total solar Irradiance (TSI) began with SMM/ACRIM.

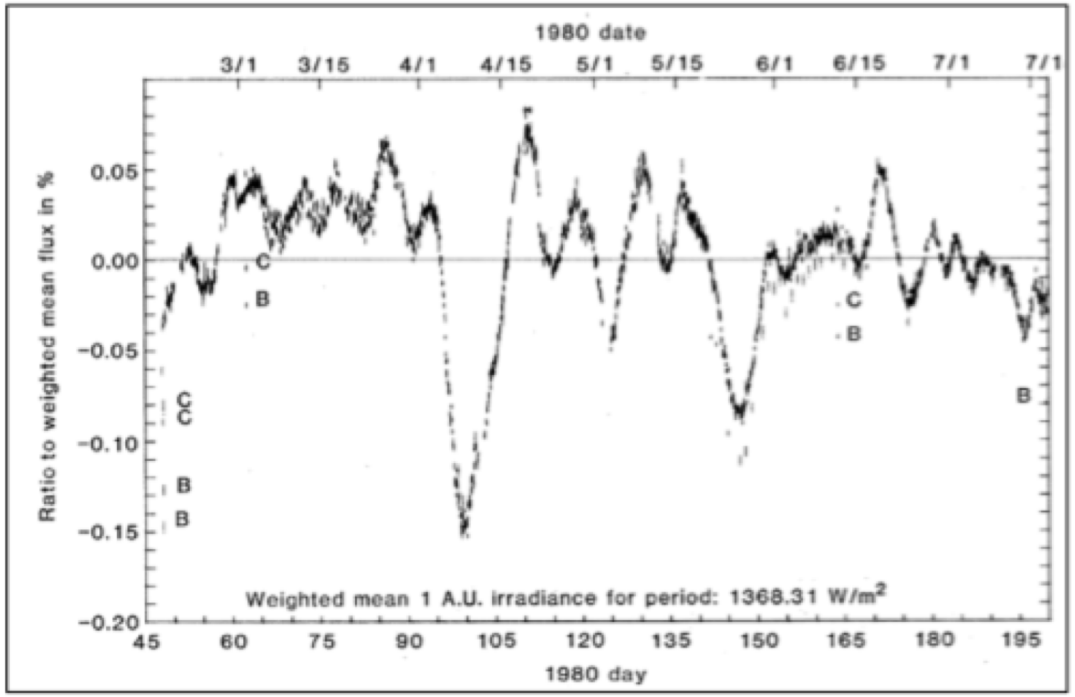
- On intermediate time scales (say, 1-100 d^{-1}, there are four sources of variation:
  - Sunspots
  - Faculae
  - Active network
  - Rotational modulation
- Literature
  - Hudson, H. ARAA 26, 473-507 (1988)
  - Lean, J. Revs. Geophys. 29, 505 (1991_

Lean (1991) summary of Solar spectral irradiance

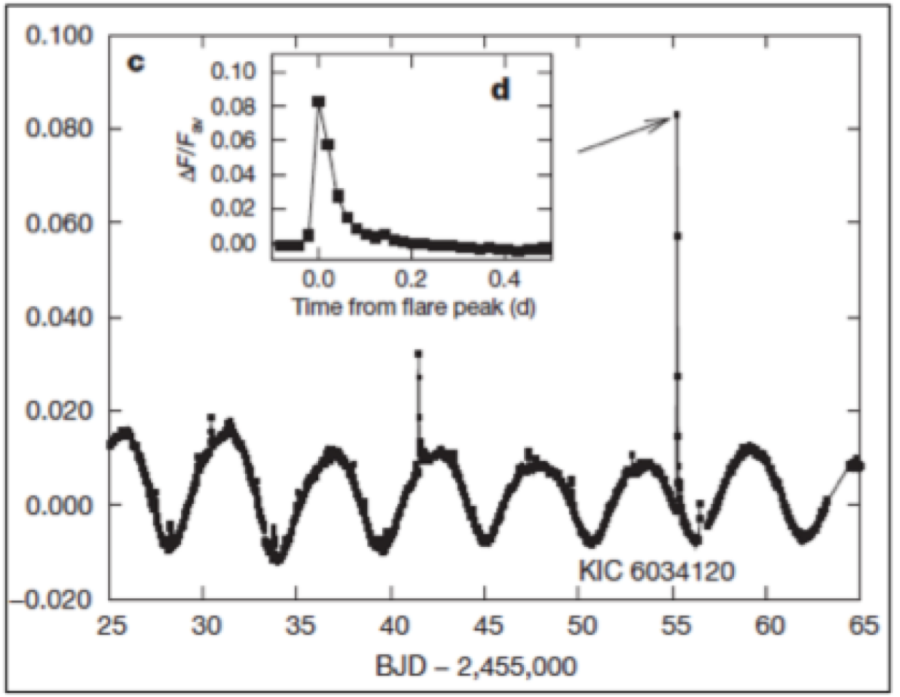
Lean (1991) summary of Solar spectral variability



Solar and stellar variability



The Sun:Willson et al. 1971



A Kepler star: Maehara et al. 2012

The Sun exhibits chaotic variability, plus “dips”;
a solar-type star may exhibit strong rotational variability, plus flares – very different!

Speculative conclusions

- The solar variability on active-region time scales comes mainly from magnetic structures imposed from the interior.
- This includes spatio-temporal coherence in flux emergence.
- The non-sunspot rotational modulation (ie, that of the stable emission structures of active regions, a.k.a. coronal heating) needs explanation.