The electron temperature distribution up to 10 R_S as derived by the DYN model

Thanassis Katsiyannis[1] & Joseph Lemaire [2]

(1) Royal Observatory of Belgium

(2) Royal Belgian Institute for Space Aeronomy

The DYN model

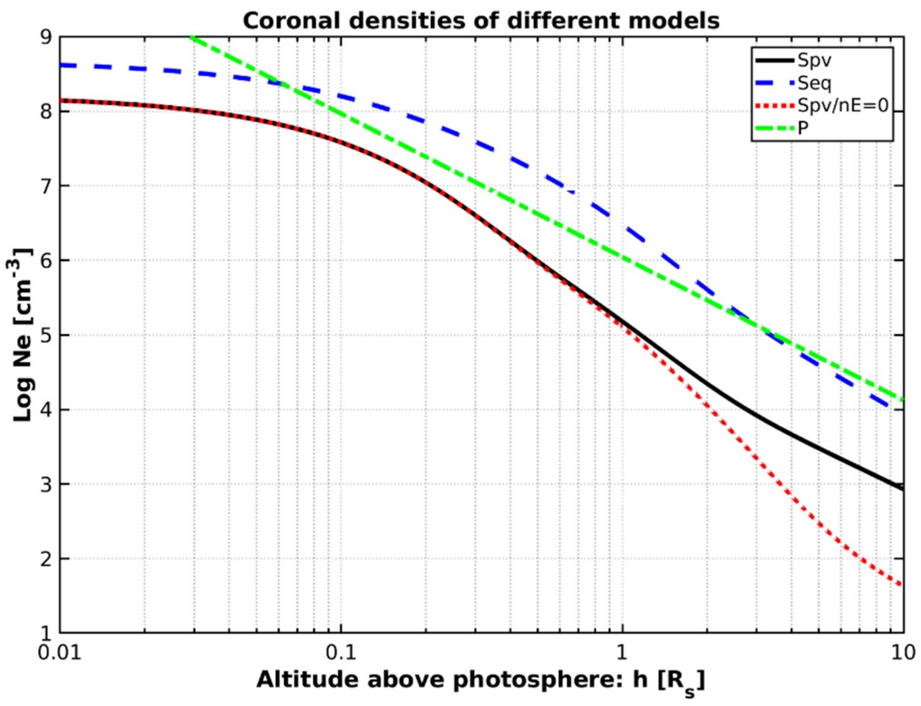
- Lemaire & Stegen (2016) added the mH ne(r) du/dt factor to Parker's (1958) model:

$$dT(r)/dr + [d(\ln n_e)/dr]^{-1} + m_H * g * R_S^2 / (k\ r^2) + m_H\ n_e(r)\ du/dt = 0$$

- Pottach (1960), Brandt et al (1965) and Gibson et al (1999) used Parker's hydro-dynamical model with T(∞)=0 and P(∞)=0.

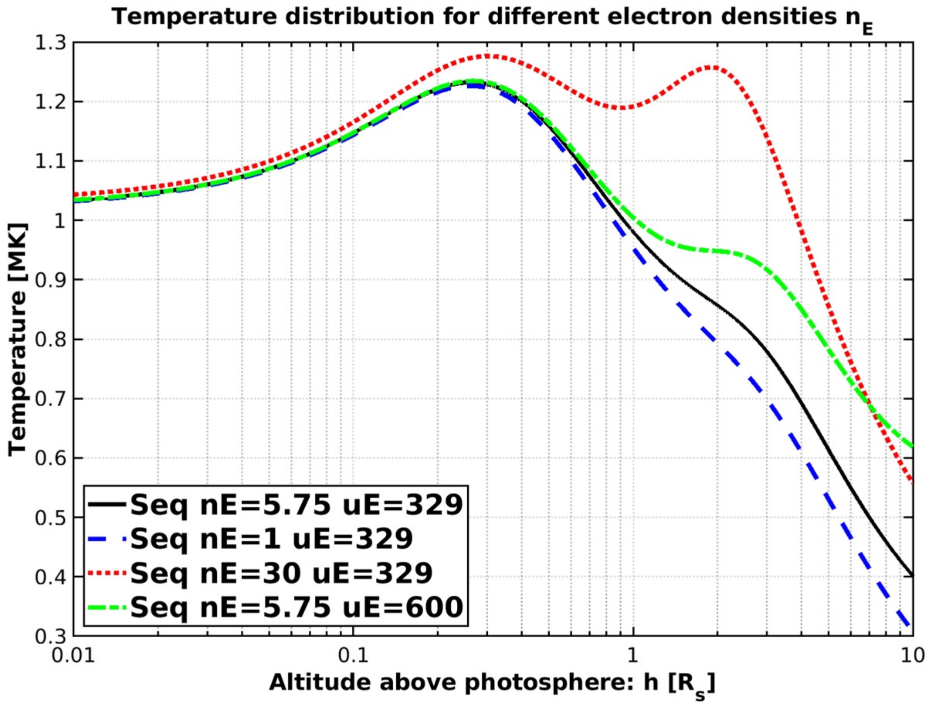
- Lemaire & Stegen (2016) also added at term to Saito (1970)'s fit. This was to correct for n_e(1AU). Saito (1970)'s fit up to 4 R_S:

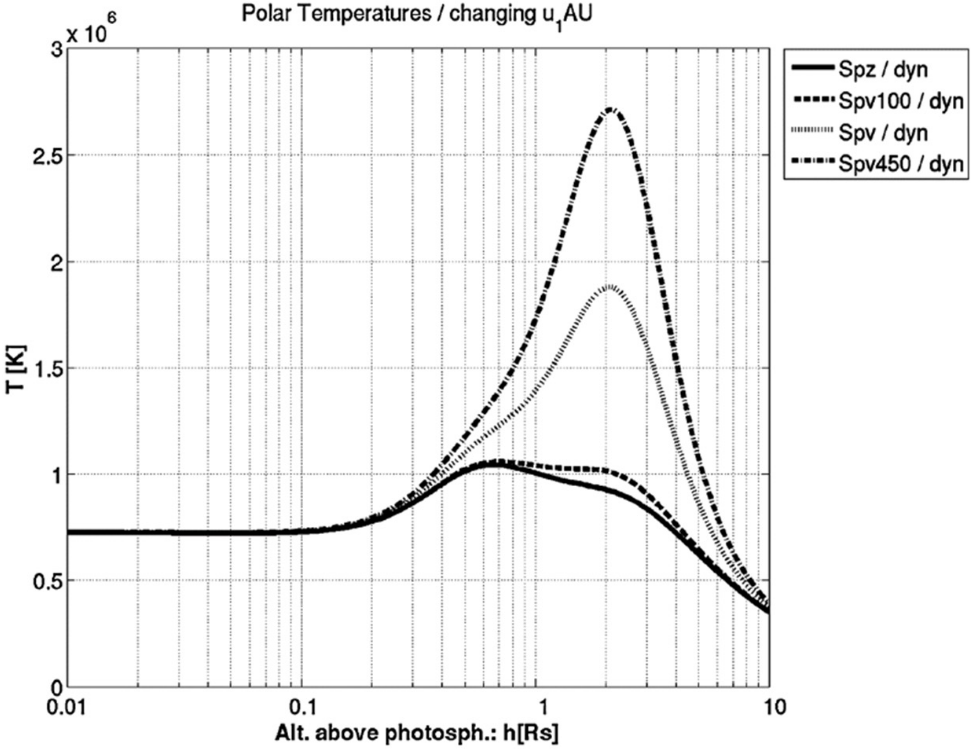
$$n_e(r) = 10^8\ [3.09\ r^{-16}\ (1-0.5\sin(\phi)) + 1.58\ r^{-6}\ (1-0.95\sin(\phi)) + 0.0251\ r^{-2.5}\ (1-\sqrt{\sin(\phi)})] + n_e(1AU)\ (215/r)^2$$



Temperature distributions / Model limitations

$$T(r) = \frac{T^*}{n(r)} \int_r^{\infty} \frac{n(x)}{x^2} dx, \text{ where } T^* = m_H * g * R_S^2 / (k \; r^2)$$





PUNCH's role

- Wind speed measurements at such low radial distances

$$[u(r) = uE \frac{A_E}{A(r)} \frac{n_E}{n(r)}]$$

- DYN is a global model that depends on the large-scale flow

- DYN is bimodal (equatorial= slow, polar= fast)