Sputtering table for Mars at solar max.

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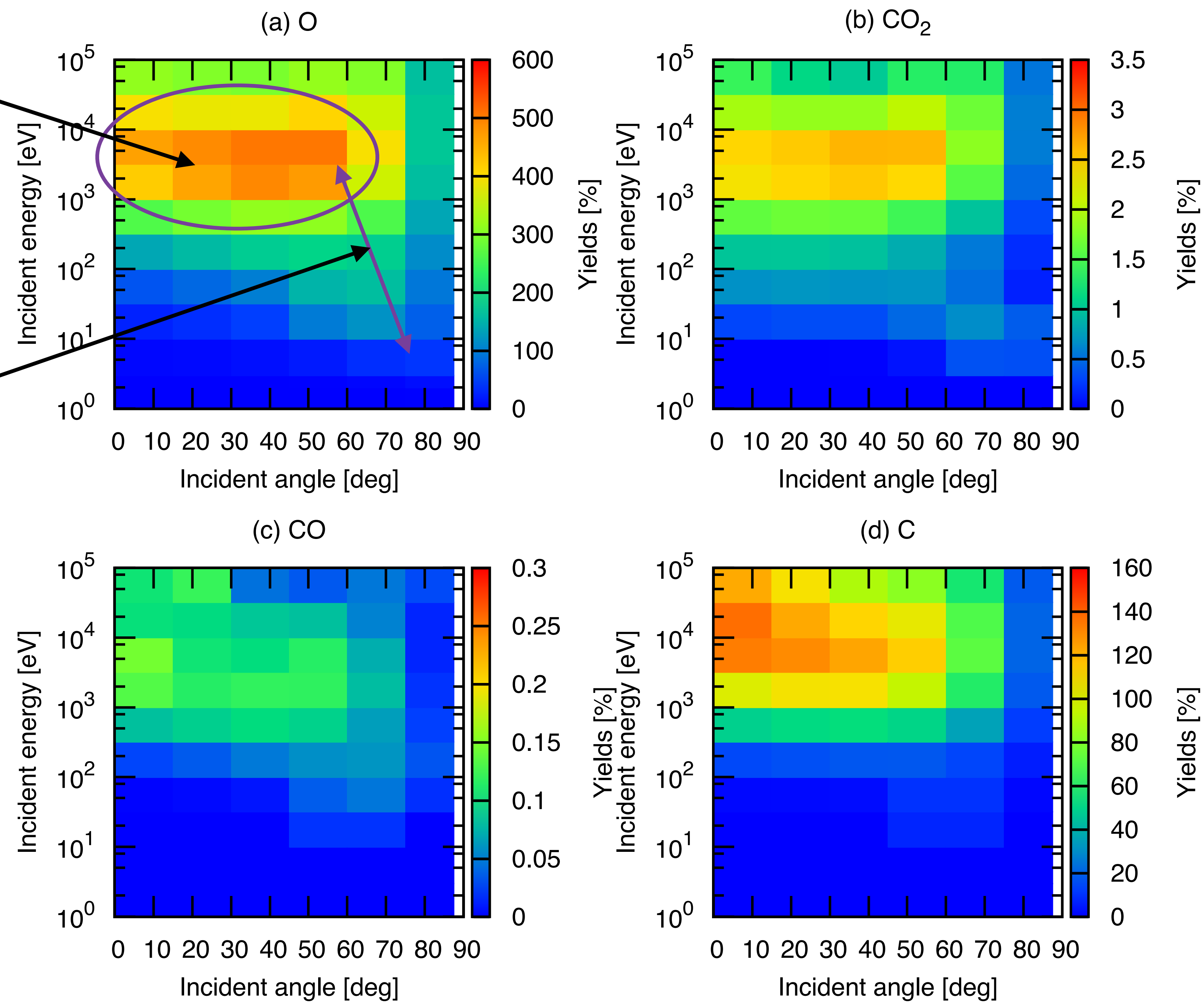
- Simulate with fixed energy and angle.
- 12 energy and 7 angle bins are completed.

Escape yields

Cascade collision dominate at keV range
⇒ Maximum with incident angle of 40-60 deg.

Increase with larger incident angle

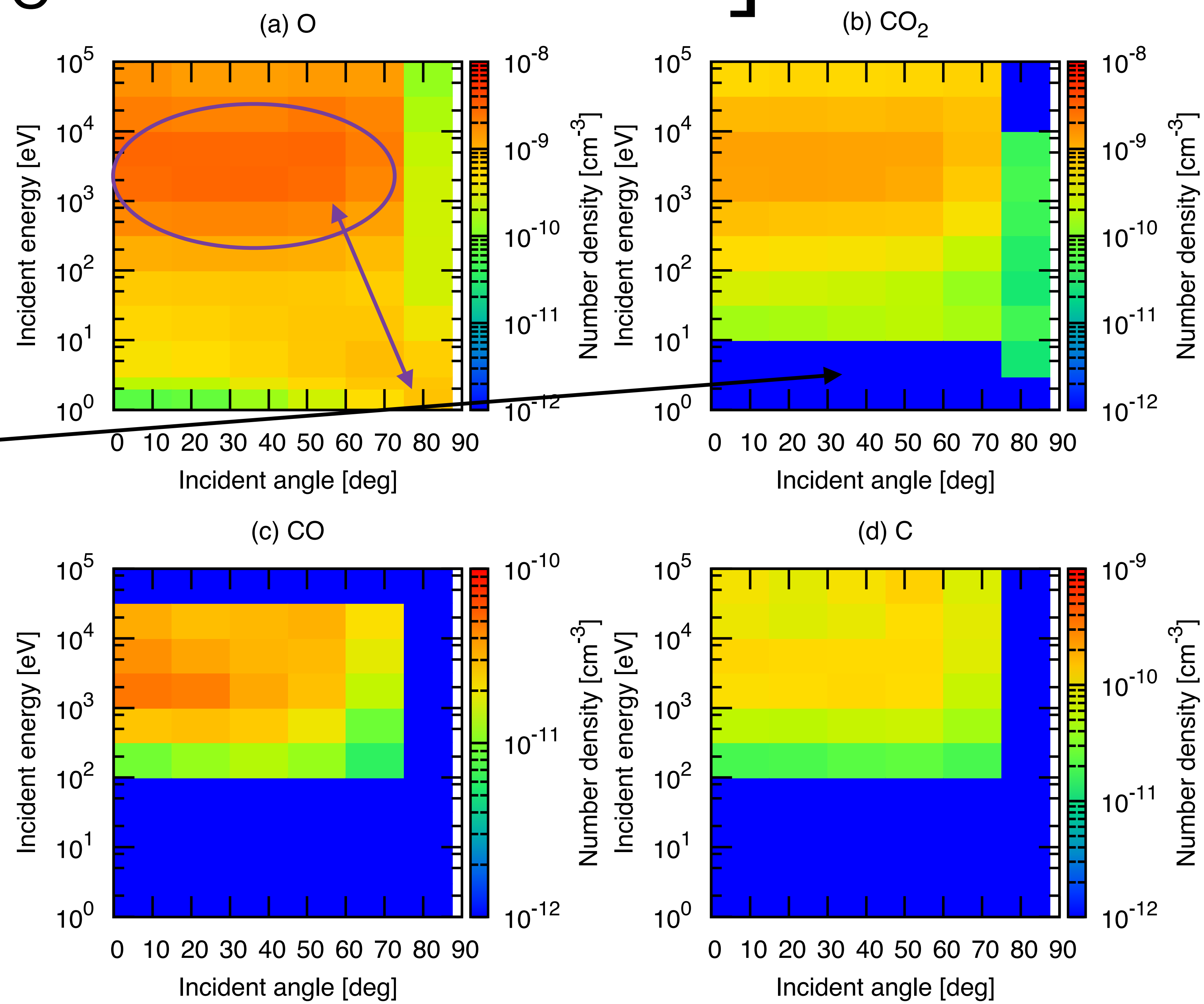


- Maximum at keV range.
- Dissociation occurs with $E_i \geq 100$ eV.

Sputtered hot corona [n_0 at 1000 km]

Similar trend as escape yields.

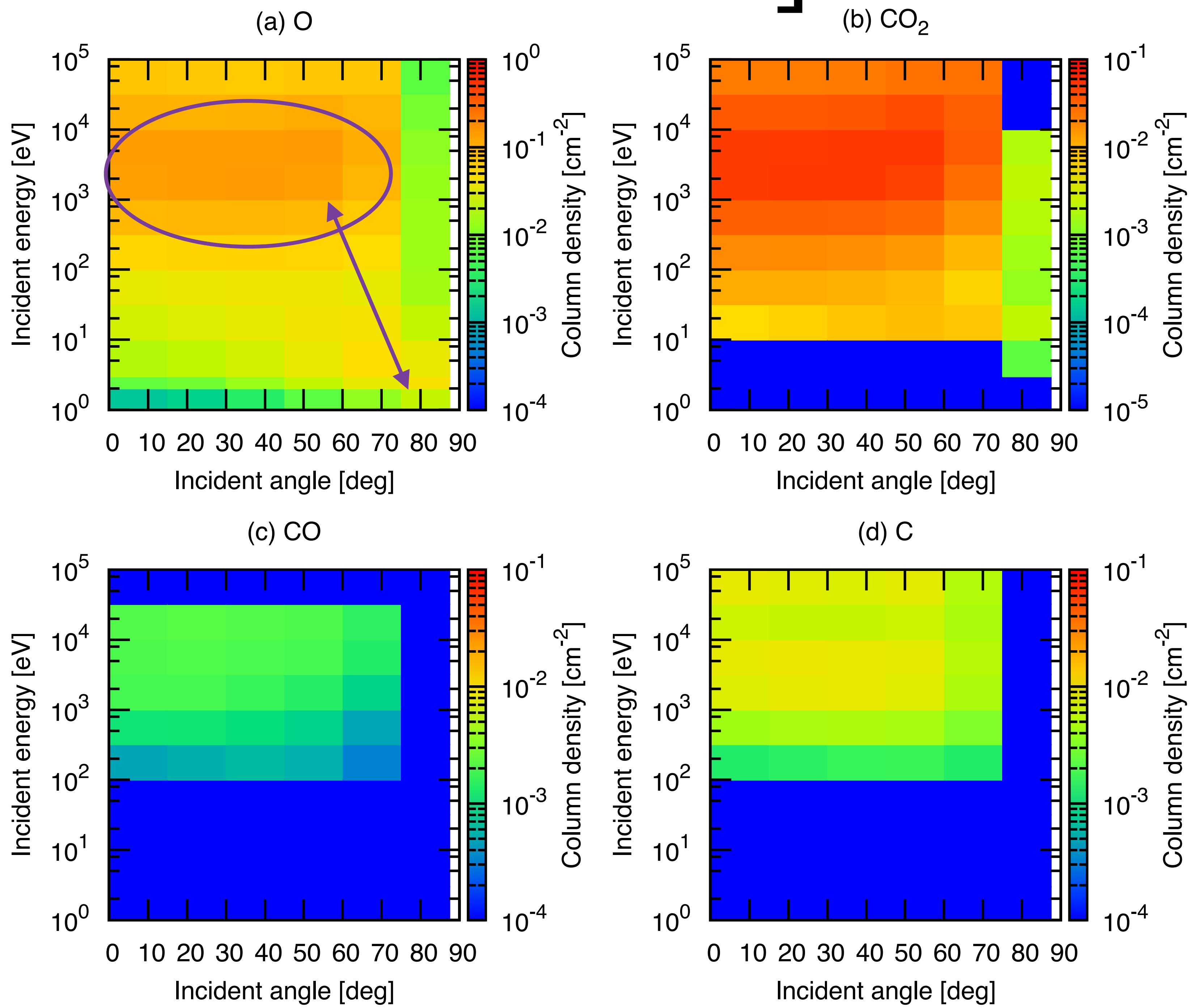
Cutoff energy at ~ 10 eV for heavier CO_2



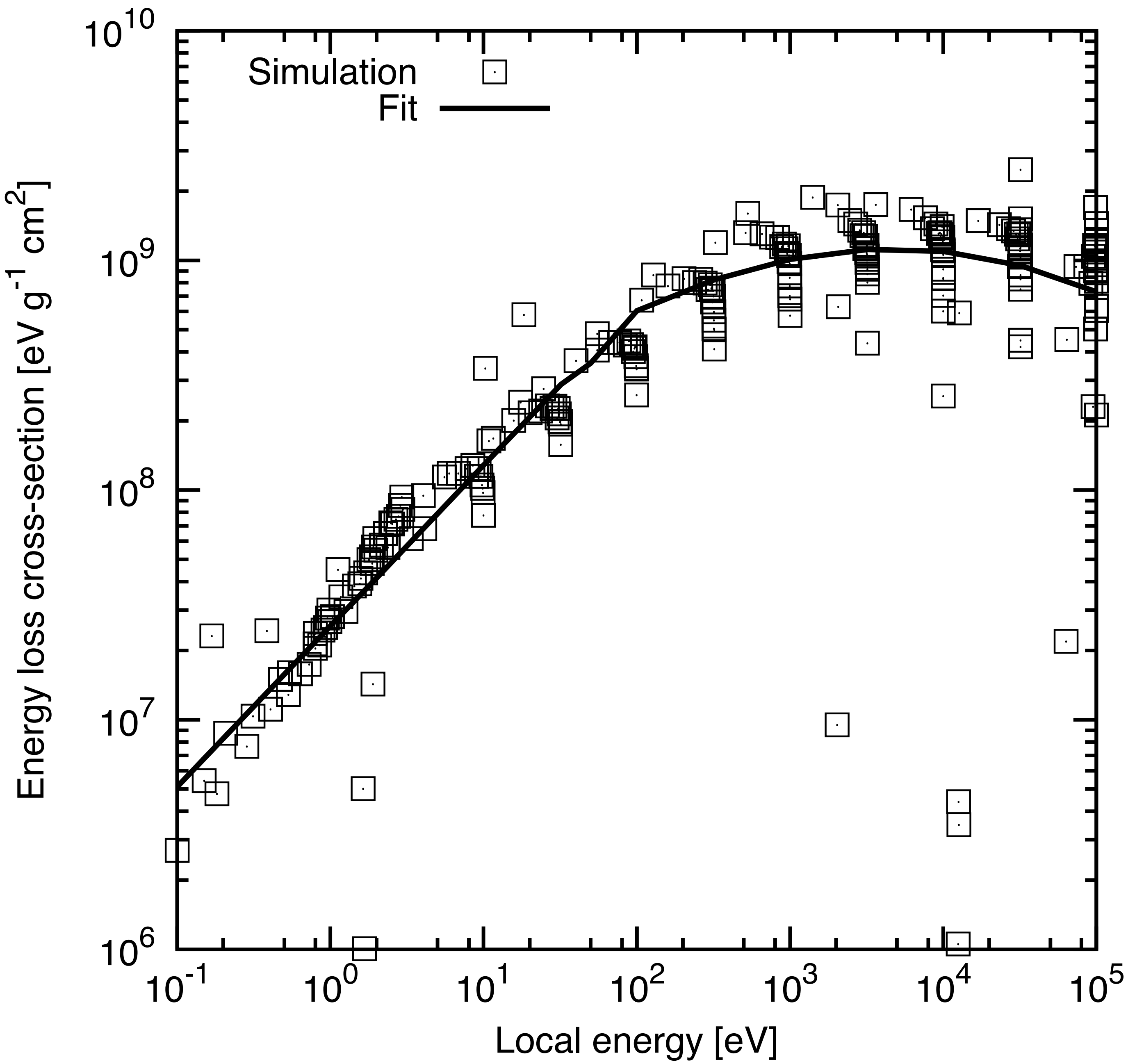
- Corona fitting method as described in *Wang et al. (submitted to JGR).*

Sputtered hot corona [n_0H at 1000 km]

Data open on line: http://sprg.ssl.berkeley.edu/~jinnee.ycwang/SputteringTable/ (Available for public in Wang et al., *submitted to JGR*)



Energy loss cross-section



- Fit cross-section $\frac{dE_{loc}}{dx}$ [eV g^{-1} cm^2] from simulations with fixed incident angle = 0 deg with

$$\frac{dE_{loc}}{dx} = \frac{1}{A\gamma_e\left(E_{loc}\right)} E_{loc}^{\left[1-\gamma_e\left(E_{loc}\right)\right]}$$

- when E_{loc} < 50 eV

$$\gamma_e\left(E_{loc}\right) = \gamma_0$$

- when $E_{loc} \geq$ 50 eV

$$\gamma_e\left(E_{loc}\right) = \gamma_1 \log E_{loc}$$

Energy deposition derivation

- Once the energy cross-section $\frac{dE_{loc}}{dx}$ [eV g^{-1} cm^2] is determined, we can calculate the energy deposition rate (*dE*) [eV cm^{-3} s^{-1}] at altitude *h* with ion flux ($f(E_i)$) [cm^{-2} s^{-1}] with energy E_i as

$$dE = f\left(E_i\right)\rho\left(h\right)\frac{dE_{loc}}{dx}$$

where $\rho\left(h\right)$ is the mass density [g/cm^3] at altitude *h*.

- At different *h*, E_{loc} should be calculated before using Equations in previous slide as

$$E_{loc} = \left[\frac{1}{A}\left(AE_0^{\gamma_e(E_0)} - \rho\left(h\right)dh\sec A_i\right)\right]^{1/\gamma_e(E_0)}$$

where E_0 is the energy before energy loss by pass altitude *dh*, and A_i is the incident angle.