Sputtering response relations: report II

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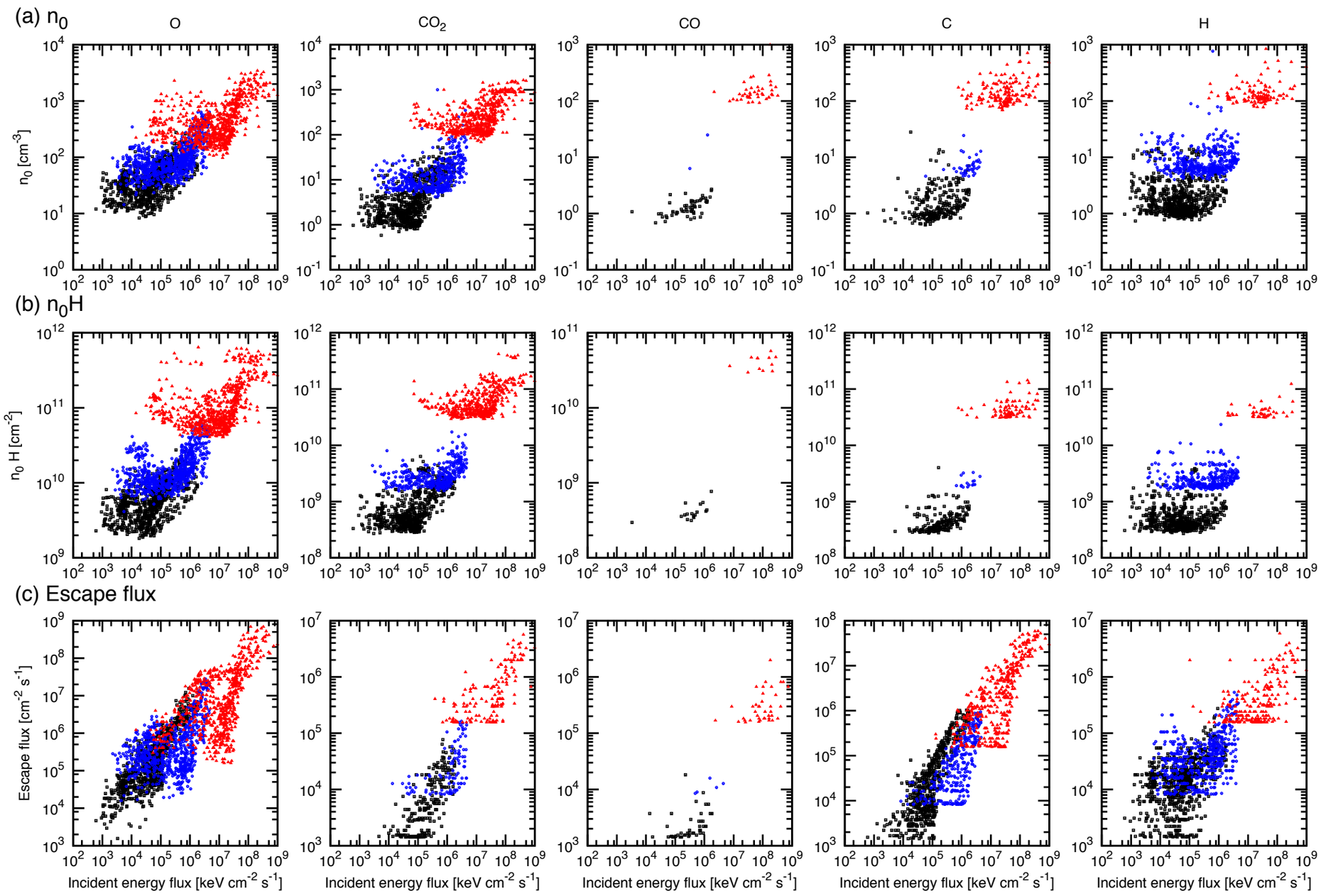
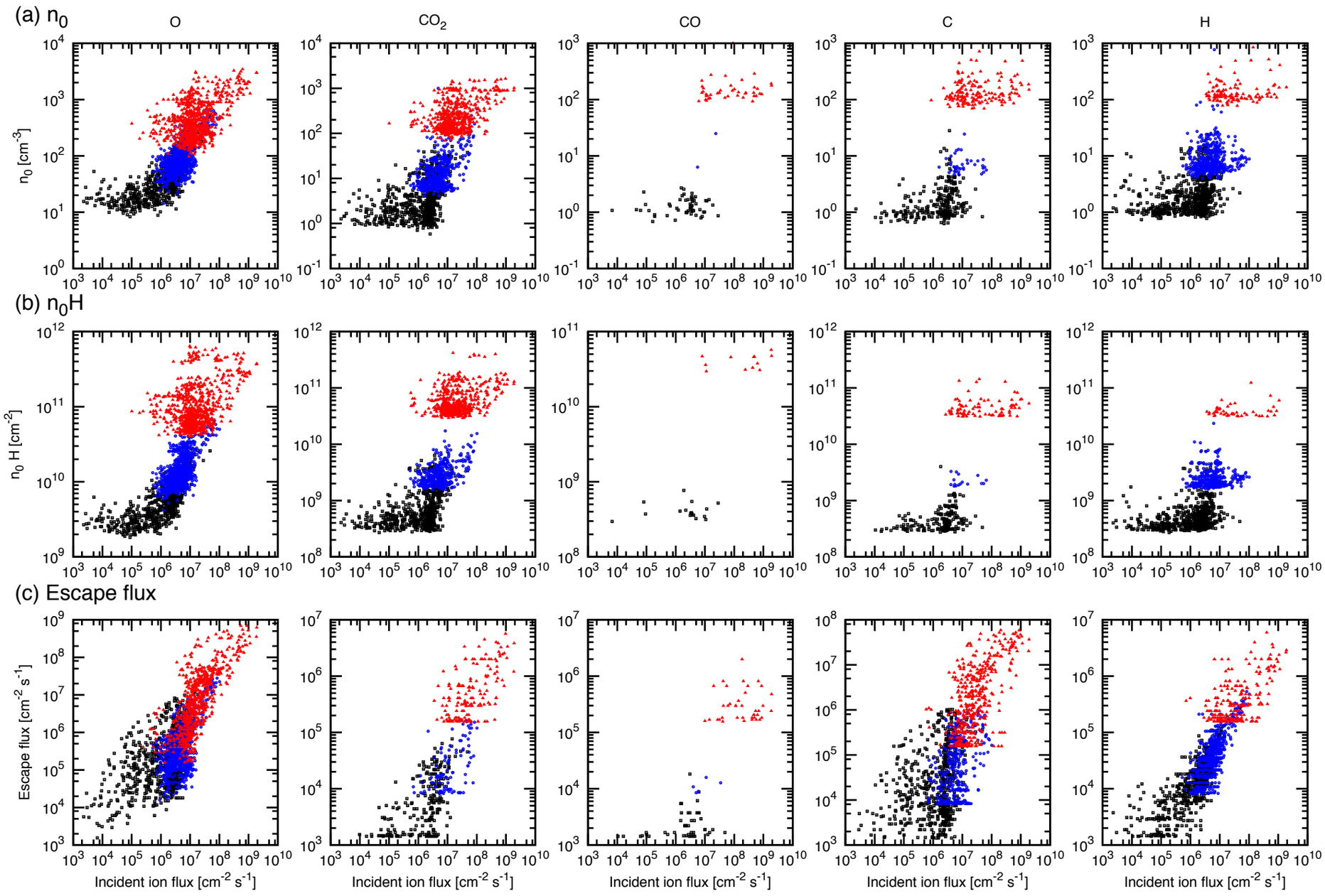
Incident energy flux

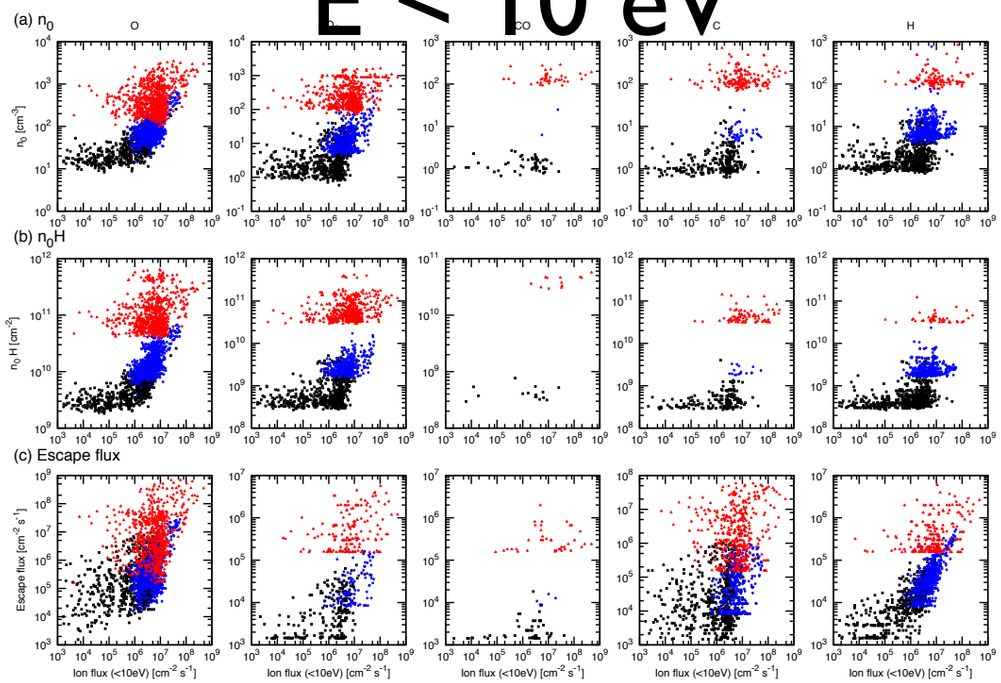


Incident ion flux

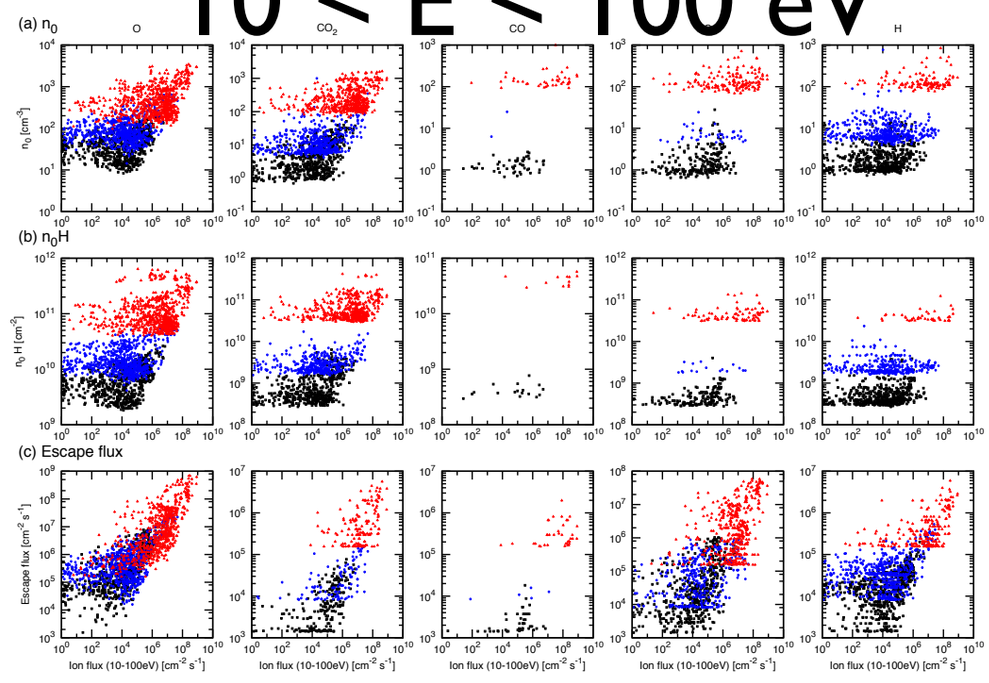


Divide energy ranges

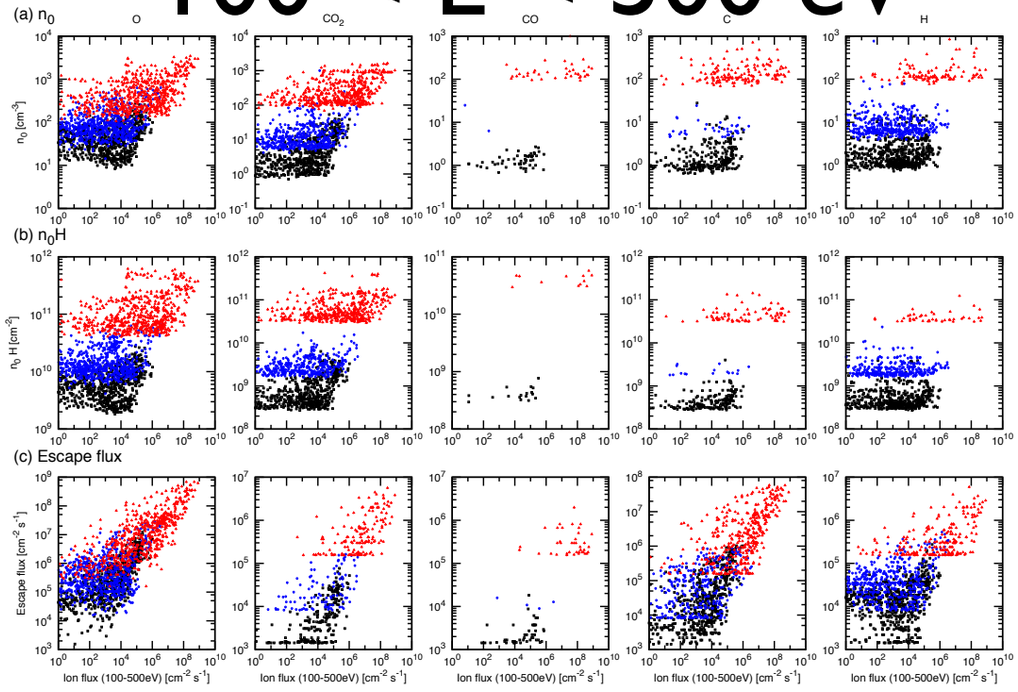
E < 10 eV



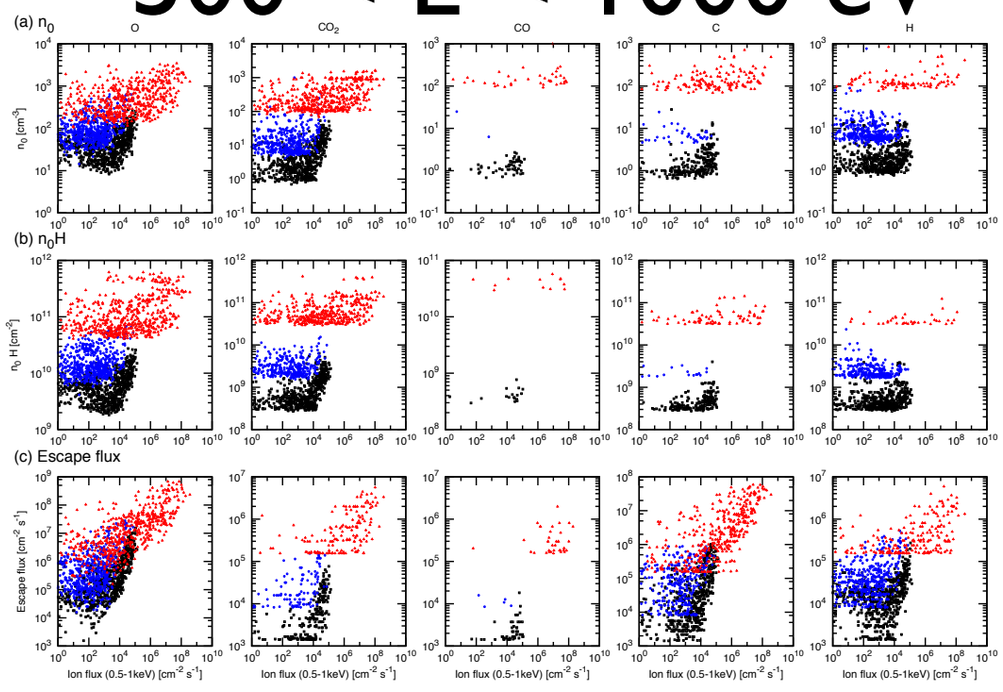
10 < E < 100 eV



100 < E < 500 eV



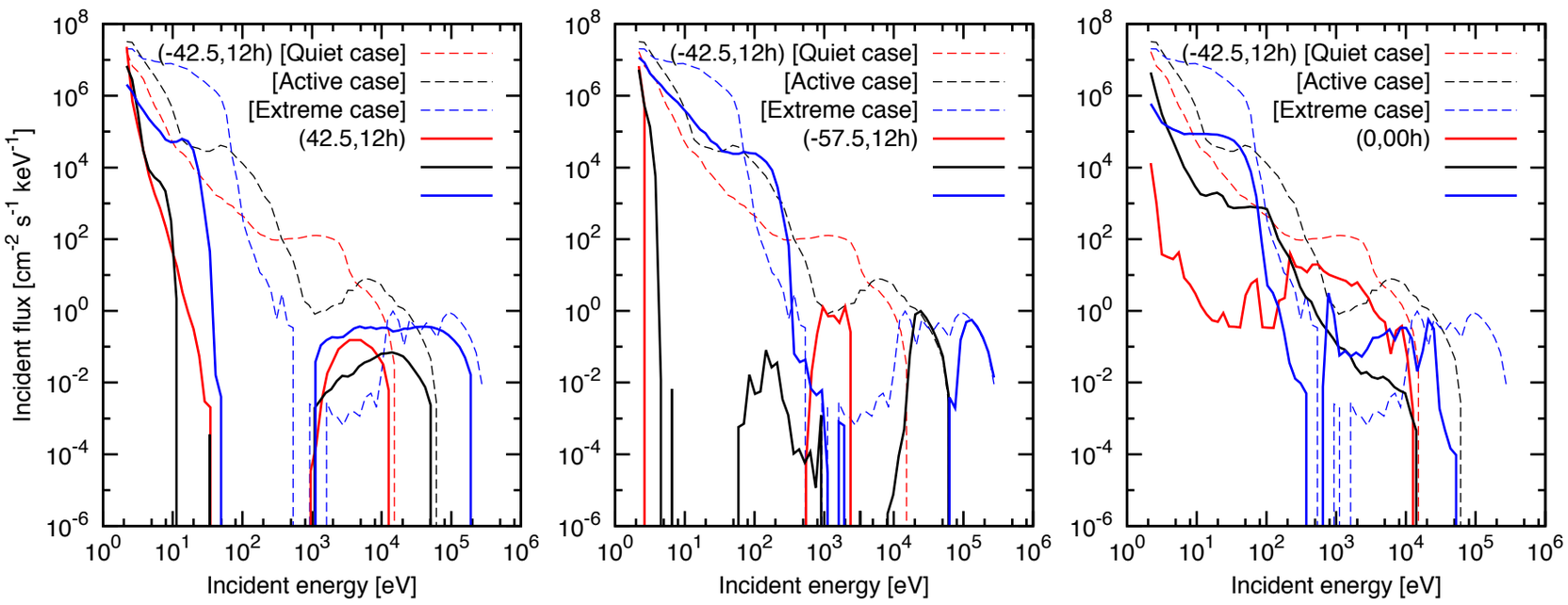
500 < E < 1000 eV



Incident spectra

- Although ions with larger energies (~1 keV) can produce hot components more efficiently,
  - ✳ Medium energy ion flux ⇒ too large variations, due to crustal field variations and pointing of solar wind electric fields.
  - ✳ High energy ion flux ⇒ relative flux is too small.

➡ "Response relations" respect to total incident flux is similar to those respect to incident flux in energy range < 100 eV.

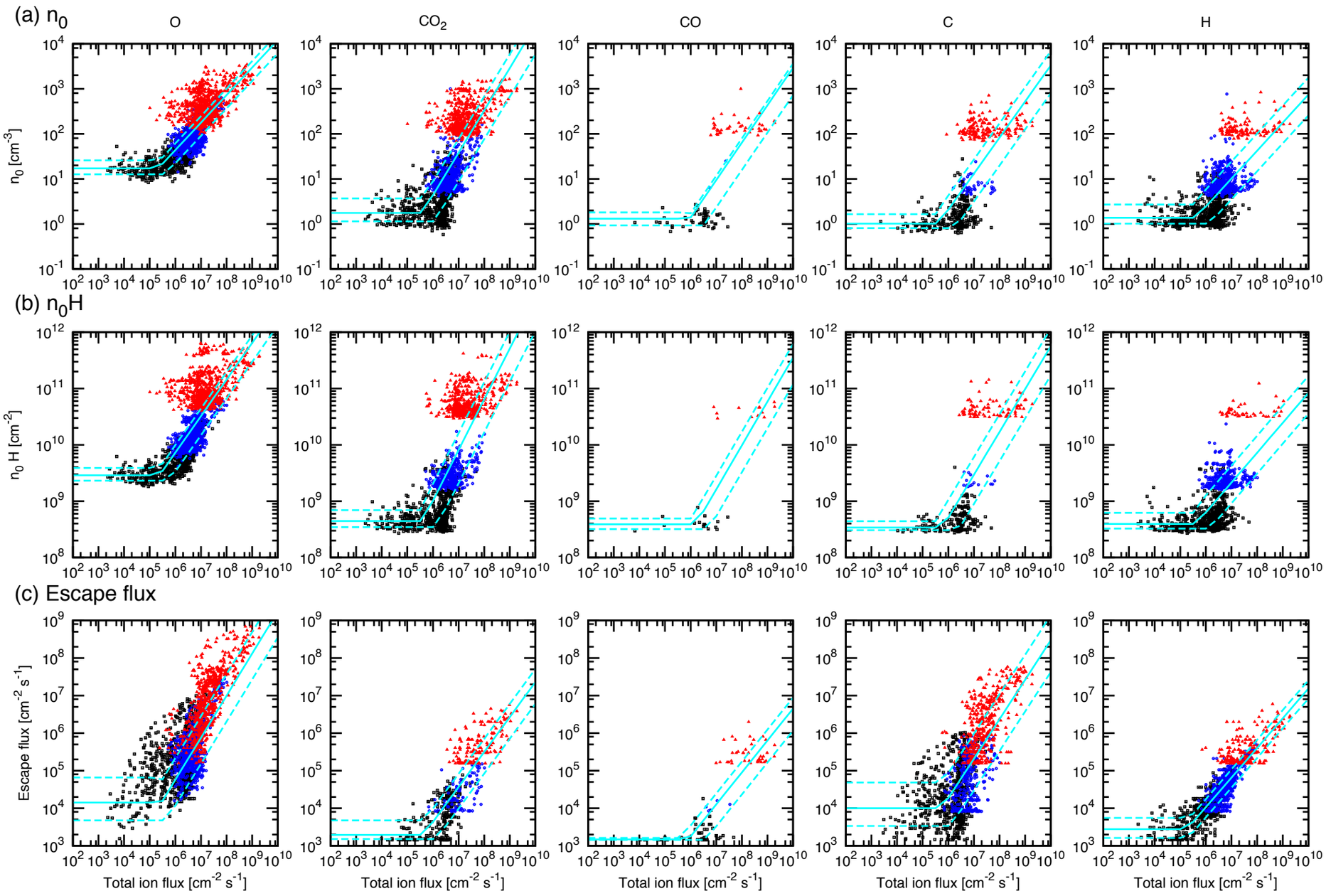


Fit with weightings

- Considering the "response relations" with respect to fluxes at certain energy ranges cannot reduce the scattering of the data.

➡ Fit the "response relations" with different weightings [W(E)] for different energy ranges, when W(E < 10eV) is fixed as 1.

Fit respect to total flux



Define deviations

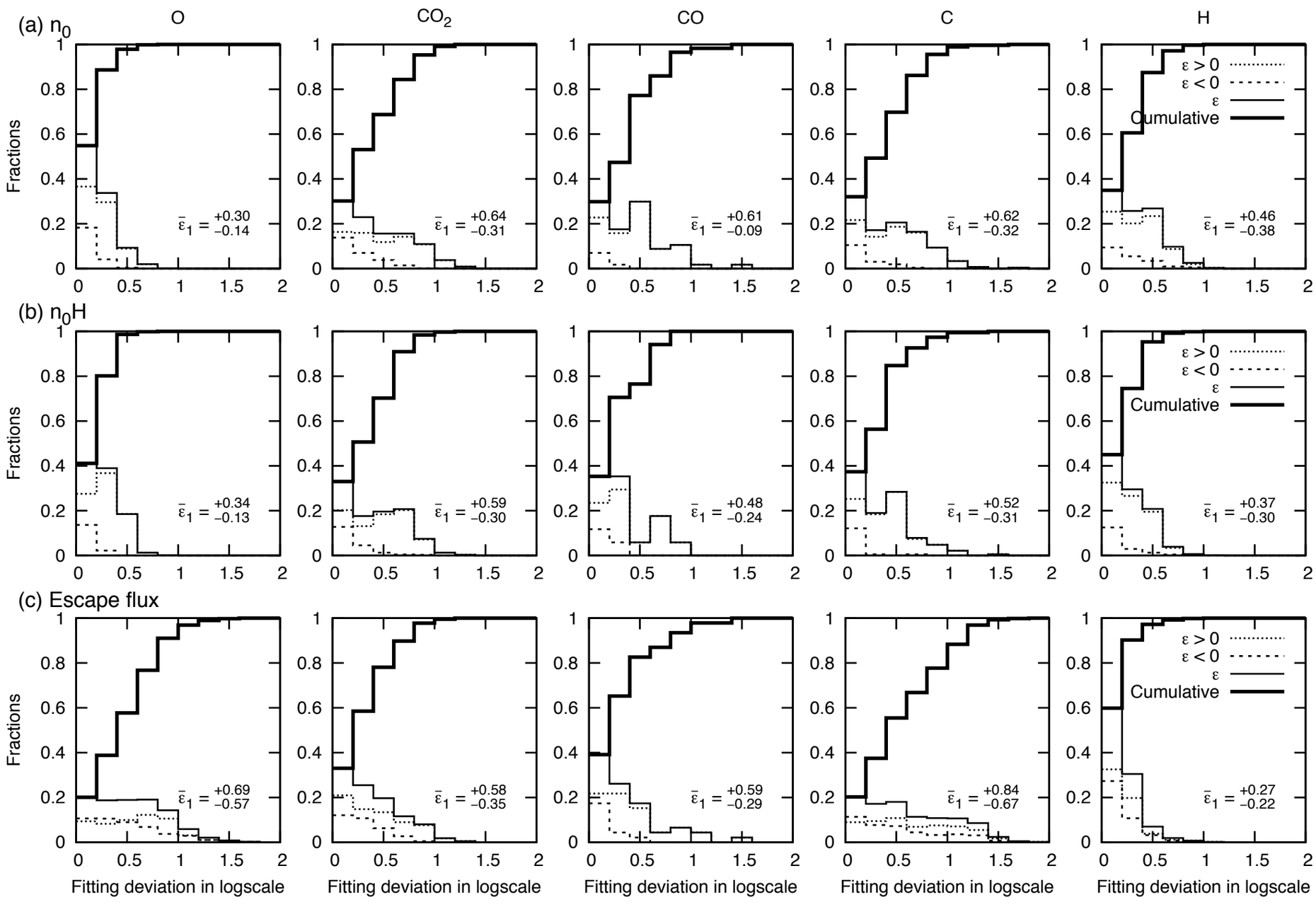
- Deviation (ε) between the modeling values [Y_m] and fitted ones [Y]:

$$\varepsilon = \log Y - \log Y_m$$

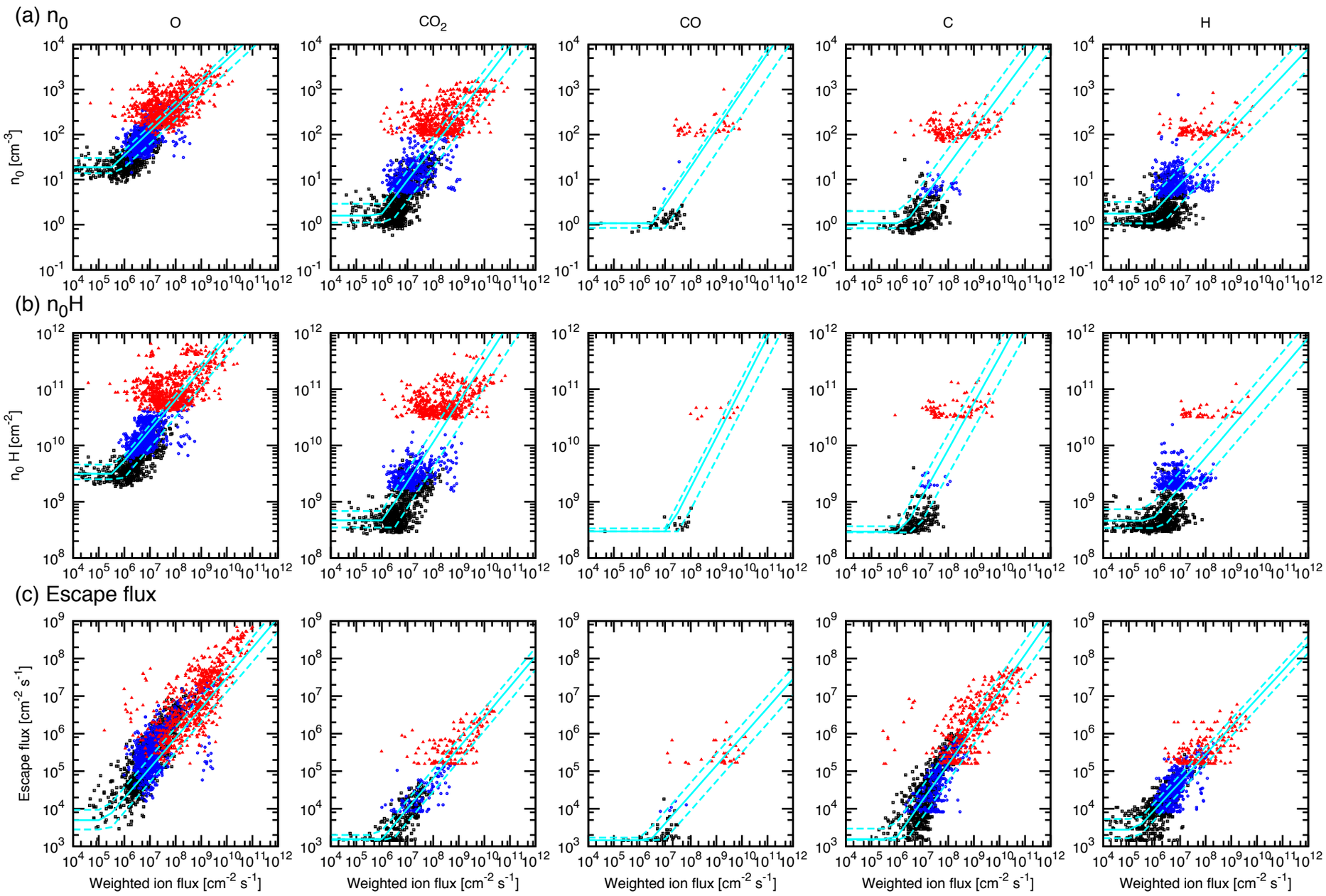
- Standard deviation:

$$\overline{\varepsilon} = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\varepsilon_i^2}$$

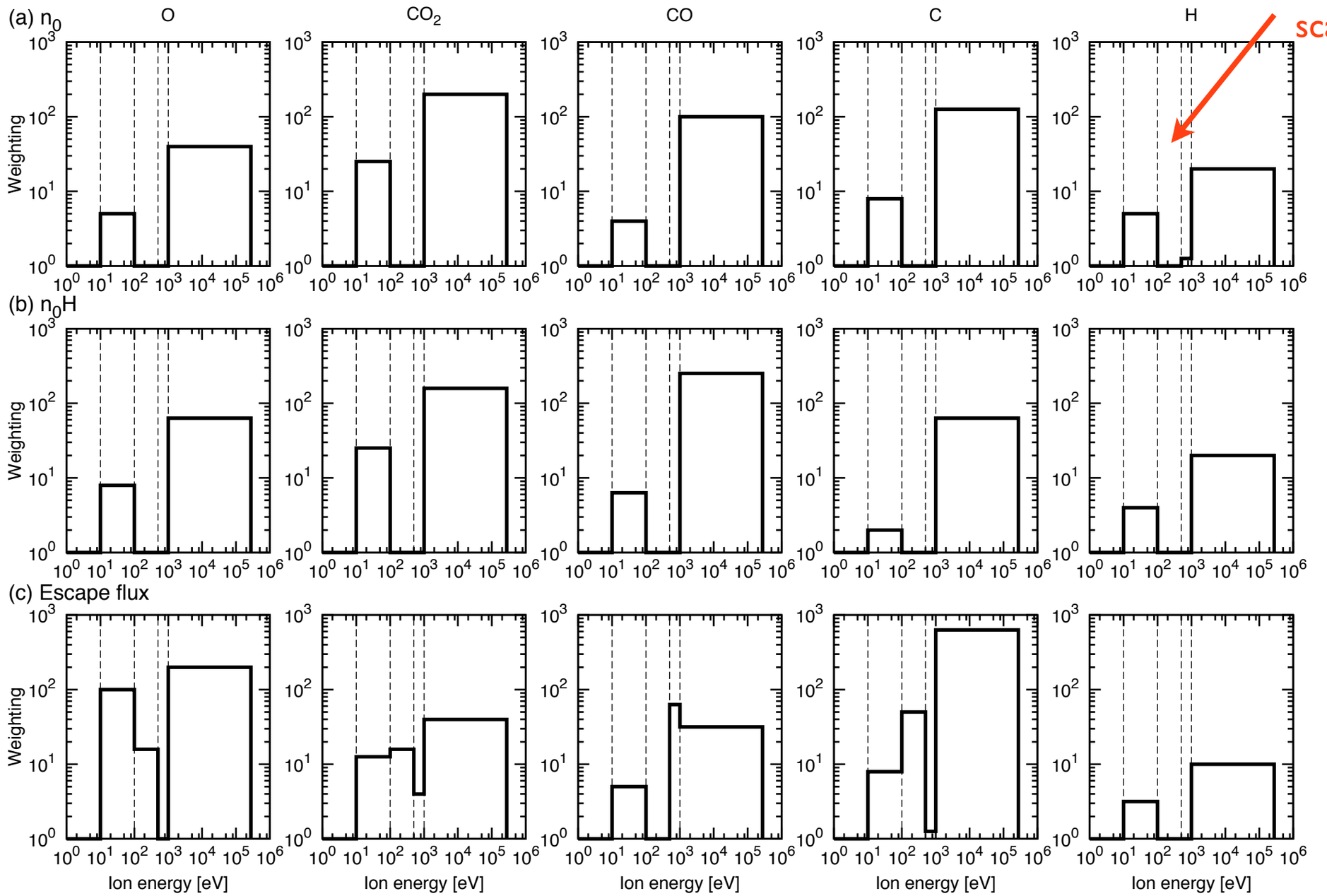
Deviations [W=1]



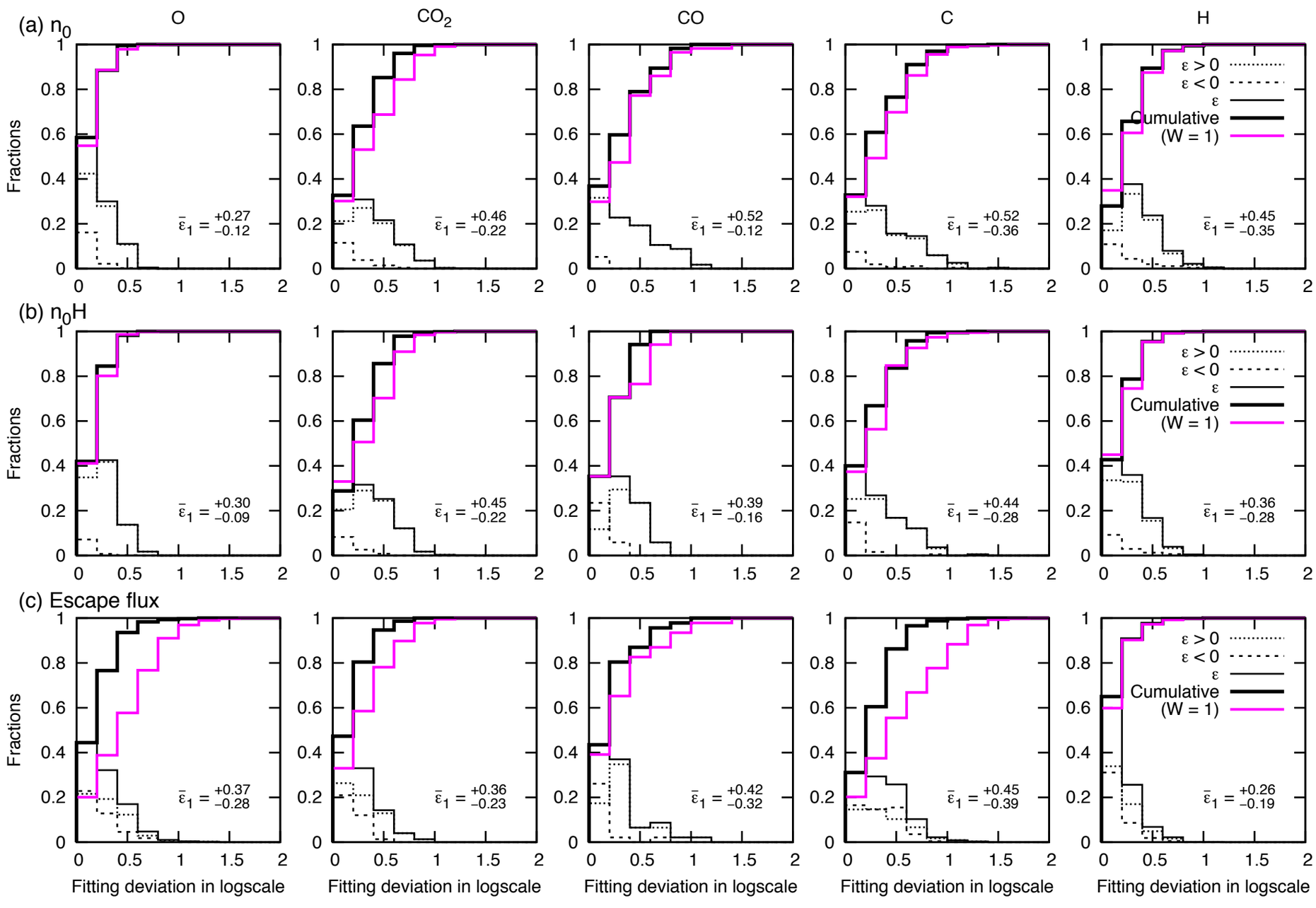
Fit with W(E)


(a) n_0
O
CO_2
CO
C
H
n_0 [cm^{-3}]
(b) n_0H
n_0 H [cm^{-2}]
(c) Escape flux
Escape flux [cm^{-2} s^{-1}]
Weighted ion flux [cm^{-2} s^{-1}]

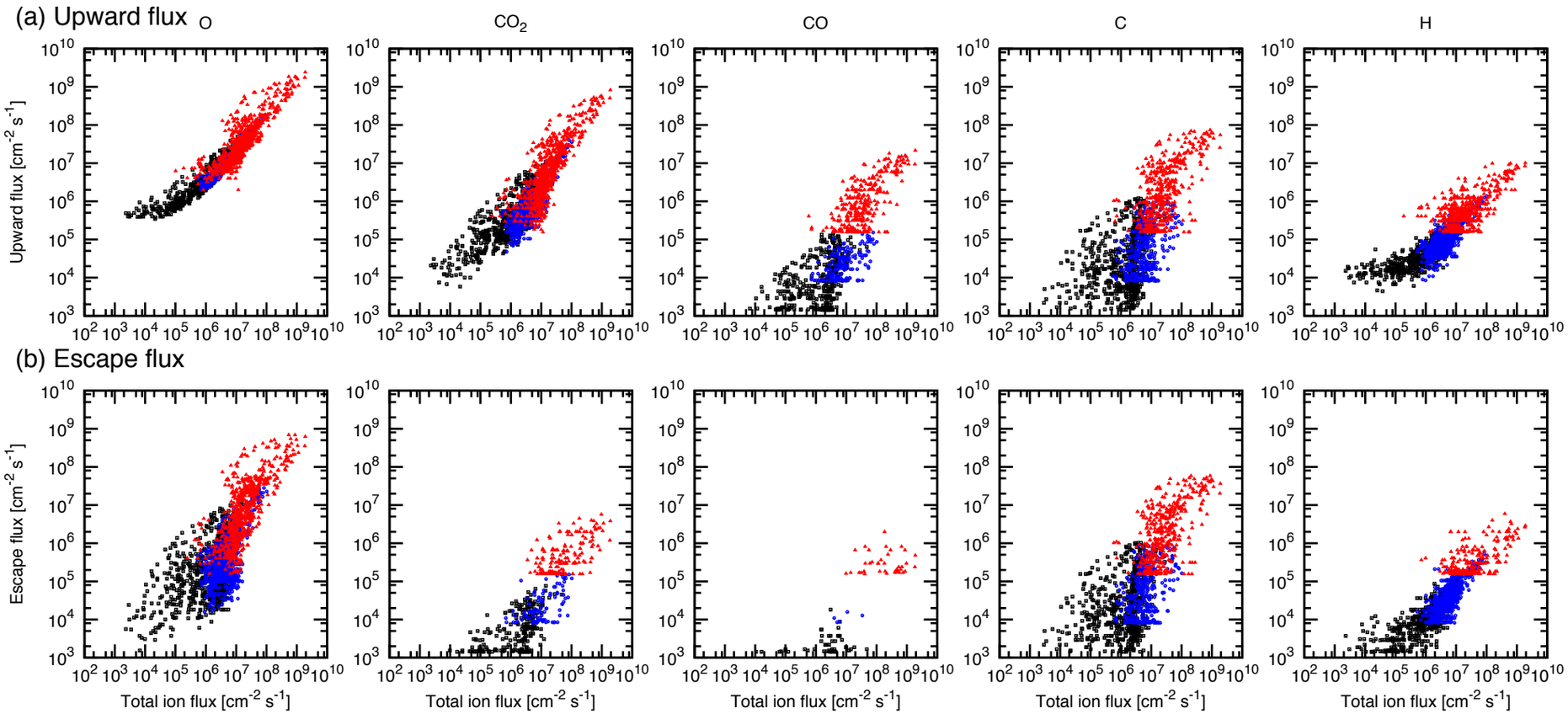
Best fitted weightings



Deviations [W(E)]



Upward & Escape flux



- Escape flux is more dependent on different incident energies and angles.
- Total upward flux at 300 km (include all atoms with E > 10 eV) is less dependent for non-dissociative components. However, when the transportation of hot atoms is taken into considerations, the hot corona distributions (n_0 & n_0H) will be smoothed out globally. Uncertainties (deviations) cannot be avoided when only local incident ion spectrum is available.

Response relations