9.5 Abundances of the Elements 239

X, H
Y, He
Z, rest

O (nebulae)
Fe (stars)
Proxy for Z

Figure 9.6
Fraction of mass that is helium, Y, plotted against relative oxygen abundance O/H (by numbers) from H II regions in our Galaxy, and in irregular and blue compact dwarf galaxies.
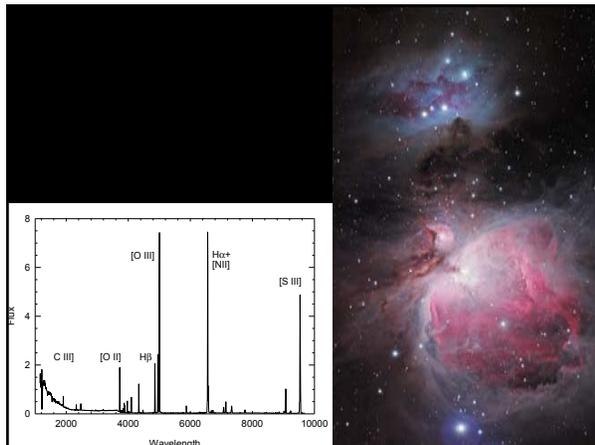
Vary Metals –temperature balance

- ◆ Model varyZ.in
  - – Z varies by 3 dex
  - – How does O/H and [O III]/Hβ vary with Z?
- ◆ First try coronal equilibrium (constant temperature)
- ◆ Then with energy balance (thermal equilibrium)

Thermostat effect AGN3 S9.5

- ◆ Vary metals with temperature balance
  - – varyZ.in
- ◆ Look at line ratios, temperature vs Z
- ◆ Cooling and heating vs Z
- ◆ Thermostat effect – line spectrum does not change dramatically when Z changes
  - – Heating and cooling are equal
  - – Cooling is mainly O III lines
  - – So they are constant when they are the main coolant