

# MPI

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- ◆ **Message passing interface**
- ◆ [http://en.wikipedia.org/wiki/Message\\_Passing\\_Interface](http://en.wikipedia.org/wiki/Message_Passing_Interface)
- ◆ **Arrays of cores which “talk” to one another**
- ◆ **Cloudy can run one model per core in its grid and optimizer modes**
  - Qualifies as “embarrassingly parallel”
  - [http://en.wikipedia.org/wiki/Embarrassingly\\_parallel](http://en.wikipedia.org/wiki/Embarrassingly_parallel)

## MPI aware systems

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- ◆ **Build directories under source**
- ◆ **Must set up your login shell**
  - mpi\_selector on our systems
- ◆ **Define special run command, “runmpi”**  
  
**mpirun -np xx path-to-cloudy.exe -r \$1**
- ◆ **Runs xx cloudy’s at one time**
  - Be careful you don’t run out of memory!

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## Grid command is MPI aware

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- ◆ **But also runs on single processors**
- ◆ **Examples**

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## Set temperature

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- ◆ **Line ratio save**
- ◆ **Save  $\rho_{\text{iii/hb}}$**
- ◆ **One zone, vary temperature see how ratio changes**
- ◆ **Vary density at constant temperature, look at emission per unit volume, and emission relative to H $\beta$**

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## Thermostat effect - abundances

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- ◆ Look at strong [O III] lines
- ◆ Solar abundance
- ◆ Increase metals 3x, 1/3
- ◆ No large change in line intensities, they do not track O/H
- ◆ Temperature decreases as  $Z$  increases due to enhance cooling

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## Same ratio, vary SED

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- ◆ Heating vs photon energy
- ◆ How temperature changes
- ◆ How lines change

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## Coronal equilibrium

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- ◆ **Grid varying temperature, look at cooling and spectrum at various temperatures**

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