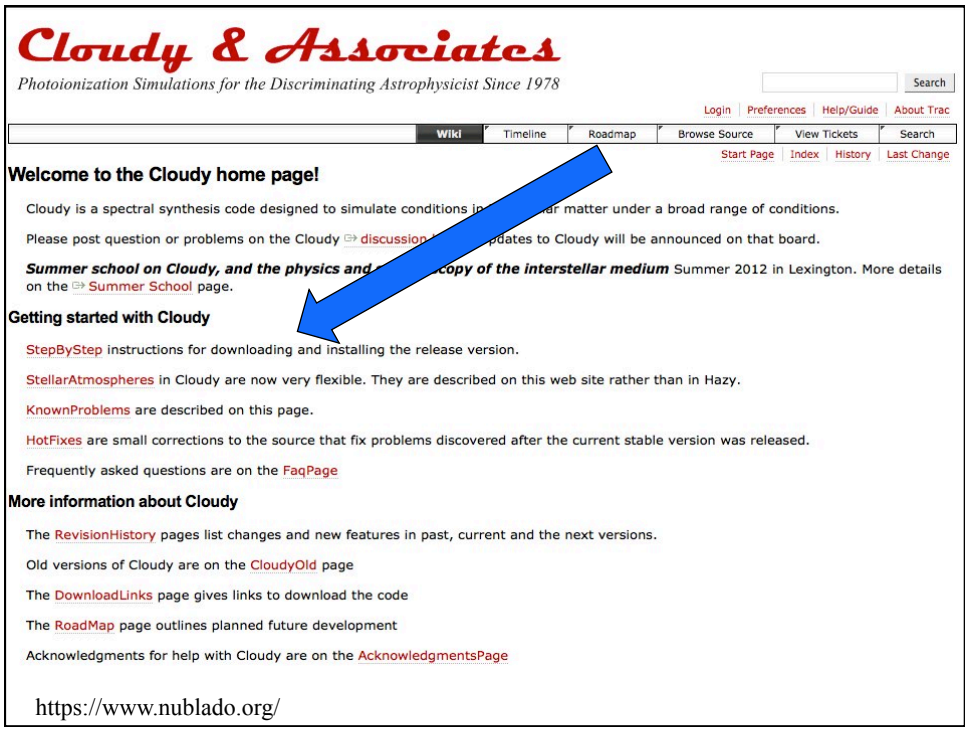
Cloudy

- **Accurate simulation of physical processes at the atomic & molecular level**
  - "universal fitting formulae" to atomic processes fail when used outside realm of validity, and are not used
- **Assumptions:**
  - energy is conserved
  - (usually) atomic processes have reached steady state
- **Limits:**
  - 2.7 K < T < 10^{10} K
  - No limits to density (low density limit, LTE, STE)
  - Radiation field 10 m to 100 MeV

https://www.nublado.org/



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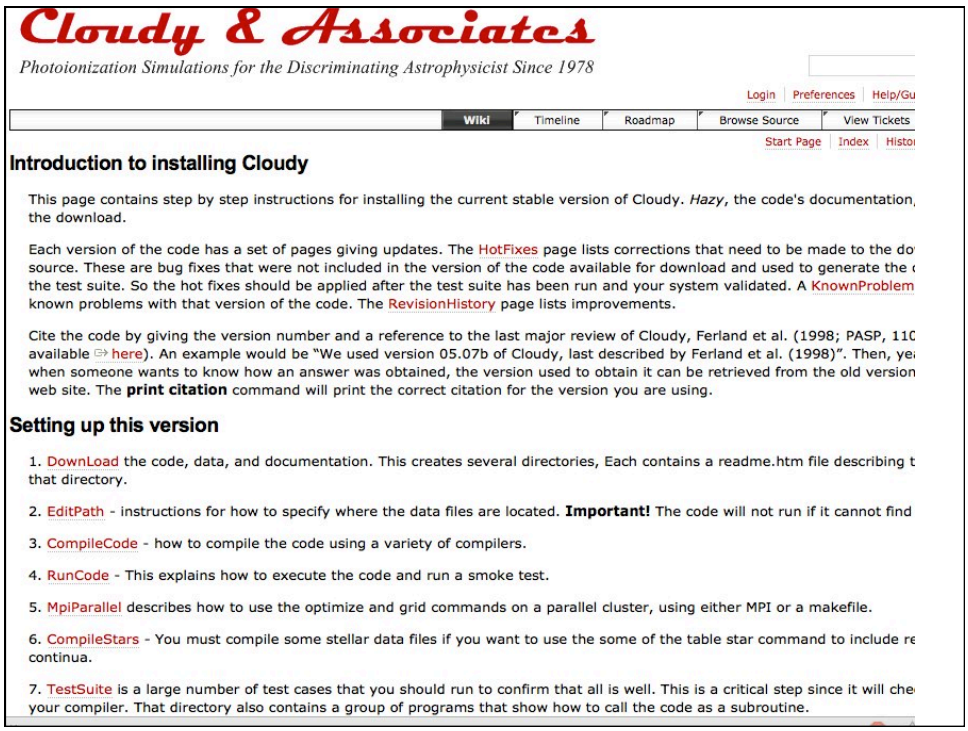
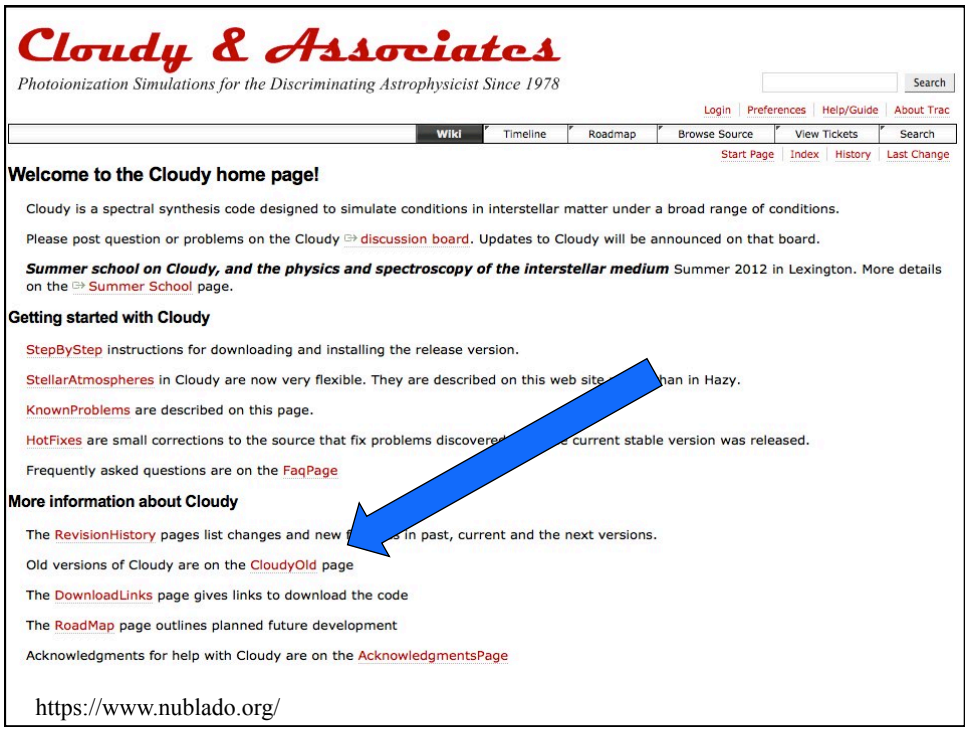
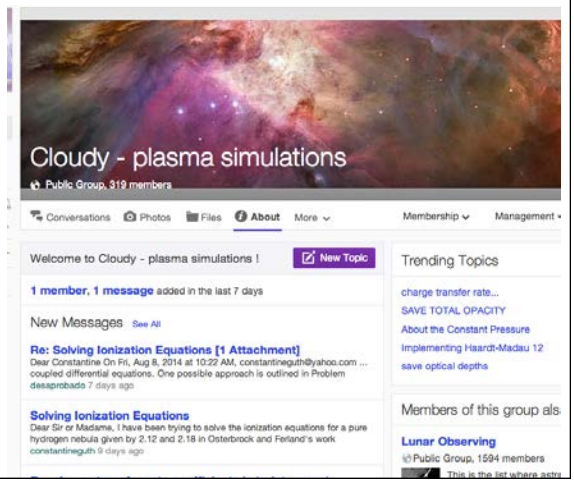




https://www.nublado.org/

Where to go for help

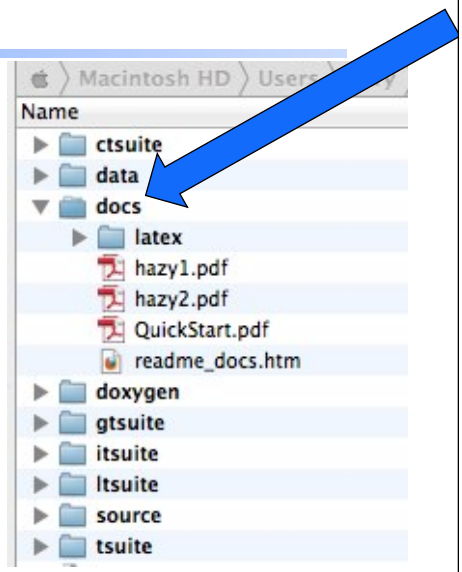
- **https://groups.yahoo.com/neo/groups/cloudy_simulations/info**



Topics (List as Individual Messages)	Messages	Latest Post
C10.00 Segmentation Fault with GCC 4.6.2 Hello, After upgrading to Fedora16 and the new GCC 4.6.2 C10.00 compiles with no complaints, but segfaults on every model including the smoke test. I have been...	7	Jun 1, 2012 2:02 pm Peter van Hoof peter_van_hoof
compile grain failed. I was trying to compile a new grain with optical constant data, but the extrapolation failed with a message 'something went wrong' in the .out file. What I...	1	May 30, 2012 12:28 pm af1815
Molecular Hydrogen Reaction Rates Hello, I have been using Cloudy to look at the molecular hydrogen fraction of the ISM at various densities, temperatures etc., however I have run into some...	3	May 30, 2012 11:00 am Gary J. Ferland gary_ferland
PROBLEM DISASTER PROBLEM DISASTER This is in the middle of some experiments, but since the log file has the request to report the problem -- the input file and the log file are here: ...	1	May 19, 2012 12:59 pm notkochanek
Understanding Compton effects Hi, I'm currently working to extend the capabilities of Knox Long's Python radiative transfer code into the X-ray regime. As part of this I'm putting Compton...	3	May 9, 2012 2:47 pm Nicholas Higginbottom nick_soton
Re: beginner	1	May 8, 2012

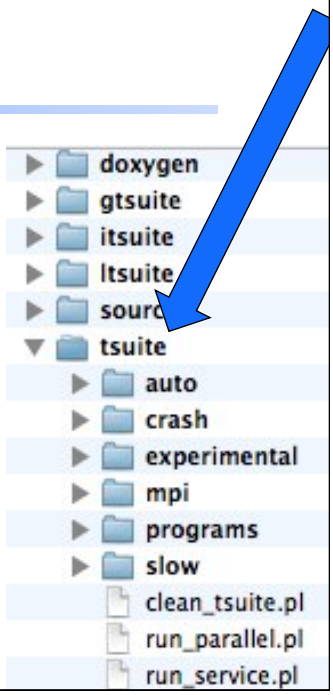
Documentation

- **Quick start guide**
- **Hazy 1, all commands**
- **Hazy 2, description of output, comparison with observations**
- **Hazy 3, not compiled, badly out of date, some physics on described there**



The test suite

- **Fully tests the code after any changes**
  - "Monitors" allow automatic comparison of current with previous results
- **Provides examples of how to use Cloudy**
  - But may include extraneous commands for testing
- **Useful examples of how to set up a simulation**



Running cloudy

- **"run" file contains path-to-cloudy.exe -r $1 2>$1.err**
- **File "model.in" contains input, then**
- **Run model &**
- **Produces output "model.out"**

Minimum to run Cloudy

- **Must specify**
  - SED – shape of the radiation field
  - Flux of photons per unit area
  - Gas density
- **May specify**
  - Gas composition, grains (solar by default)
  - Gas equation of state
  - Stopping criterion

Parameters – the SED

- **Quick start guide Chapter 5**
- **Hazy 1, Chapters 4, 6**
- **Can be specified as a fundamental shape such as a blackbody**
- **Generally entered as table of points**

SED brightness – the intensity case

- **Specify ϕ(H) – photons per unit area**
  - The "intensity case"
  - predicts emission per unit area
  - Inner radius of cloud does not need to be specified

SED brightness – the luminosity case

- **Specify Q (H) – photon luminosity**
  - Inner radius of cloud must be specified, since $\phi(H) = Q(H) / 4\pi r^2$
  - predicts emission line luminosities

Cloud density

- "hden" command
- Constant density by default
- Other equations of state possible

Composition

- Solar, no grains, by default
- Other standard mixes possible