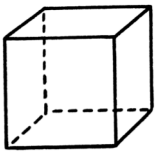
A "unit cell"

- We will sometimes model a cubic cm of matter
  - A "unit cell", 1 cm^3
- Lots faster & simpler
- These commands do a single "zone" that is log(dr)=0 (or 1 cm) thick
  - stop zone 1
  - set dr 0



Command deck as unit cell

- Stop zone 1
- Set dr 0
- blackbody, T=4.87e4 K # the AGN3 Table 2.3 entry for O4 V
- Q(H) 49.70
- radius 19
- hden 3
- abundances HII region
- cosmic ray background
- CMB
- iterate
- print last iteration
- save overview "M16.ovr" last
- save continuum "M16.con" units microns last

Results for one zone

```
#### 1  Te:1.815E+04 Hden:1.000E+04 Ne:1.198E+04 R:1.000E+16 R-R0:5.000E-01
Hydrogen      5.78e-08 1.00e+00 H+o/Hden 1.00e+00 4.12e-18 H-    H2 1.05e-22
```

Gas kinetic temperature

Results for one zone

```
#### 1  Te:1.815E+04 Hden:1.000E+04 Ne:1.198E+04 R:1.000E+16 R-R0:5.000E-01
Hydrogen      5.78e-08 1.00e+00 H+o/Hden 1.00e+00 4.12e-18 H-    H2 1.05e-22
```

H^0, H^+ ionization fractions
n(x)/n(H, all forms)

Results for one zone

```
#### 1  Te:1.815E+04 Hden:1.000E+04 Ne:1.198E+04 R:1.000E+16 R-R0:5.000E-01
Hydrogen      5.78e-08 1.00e+00 H+o/Hden 1.00e+00 4.12e-18 H-    H2 1.05e-22
```

H_2 fraction
$2n(H_2)/n(H, \text{all forms})$

Warnings, cautions, notes

- Cloudy is designed to be autonomous and self aware
- Generates notes, cautions, or warnings, if conditions are not appropriate.

```
 Calculation stopped because NZONE reached. Iteration 1 of 1
 The geometry is plane-parallel.
-Continuum zero at some energies.
-The H Lyman continuum is thin, and I assumed that it was thick.  Use the ITERATE command to do more iterations.
-The He II continuum is thin and I assumed that it was thick.  Use the ITERATE command to do more iterations.
-The He I continuum is thin and I assumed that it was thick.  Use the ITERATE command to do more iterations.
!Destruction of He 2TriS reached 32.0% of the total He0 dest rate at zone 1, 32.0% of that was photoionization.
!Non-collisional excitation of [O III] 4363 reached 12.61% of the total.
!AGE: Cloud age was not set.  Longest timescale was 5.40e+08 s = 1.71e+01 years.
!Local grain-gas photoelectric heating rate reached  63.5% of the total.
!Grain photoelectric heating is VERY important.
!The CMB was not included.  This is added with the CMB command.
```

Check end of output

```
 Cloudy ends: 1 zone, 1 iteration, 4 cautions. (single thread) ExecTime(s) 8.80
 [Stop in cdMain at ../maincl.cpp:517, Cloudy exited OK]
~
```

We did 10^{19} cm, about 3 pc

- Now do 21, 23
- 17, 15, 13

- Plot