To control cloud properties in rstar6b

(1) To control Cloud Optical Thickness, you must rewrite MPTC and CNPT in the file *data* (Fig.1). In Fig.1

- MPTC =1 means water cloud model is selected
- CNPT means optical thickness at a scaling wavelength WLCN if ICN = 2.

```
1   1   0   2   2                : ISOL INDA   INDG IMTHD NDA
1    60.0                        : NA0 TH0
1   180.0                        : NA1 TH1
1    0.0                         : NFI   FI
1                                : NW0
0.0 0.0                          : RX
1.0                              : RF
10                               : NWL/ WL (Micron), DW (micron), GALB
1.60    0.25    0.4     0.5      1.0     2.0     4.0     5.0     10.0    20.0
0.0     0.0     0.0     0.0      0.0     0.0     0.0     0.0     0.0     0.0
0.1     0.1     0.1     0.1      0.1     0.1     0.1     0.0     0.0     0.0
6 45                             : IATM NLN/ IPB
46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15
14 13 12 11 10 9 8 7 6 5 4 3 2 1
1    0.98                        : IFRH TRH
1    2    0.5E-4                 : NPOLY ICN WLCN : (Maritime)
1    10.                         : NCOMP CNPT
1                                : MPTC
1.0                              : VPTC
```

Fig.1 An example of *data*

(2) To control Cloud Droplet Distribution, you must rewrite Rmin, Rmax, Vertical dry particle volume concentration and Parameter packet in *AERDB* (Fig.2)

- Rmin is minimum particle radius (cm) for calculation
- Rmax is maximum particle radius (cm) for calculation

  Note: Rmax = 30.0E-4 cm (default) may be small for usual cloud droplet distribution.

- Vertical dry particle volume concentration is used for cloud layer setting. Height at each layer is given in *MLATMD* (Fig.3). In Fig.2 and 3, Cloud top (bottom) is at 5.0km (3.0km).

- Parameter packet is parameters for volume size distribution [v(r) = dV/dln r].
- In Fig.2 PR(1) = 2 means log-normal distribution [v(r) = C * exp((ln(r/Rm)/ln(S))**2 / 2)]
- PR(2) = 1.0, PR(3) = 1.5 and PR(4) = 8.0E-4 are C, S, and Rm, respectively.

  Note: Rm is Volume Mode Radius. Rm get convert to Droplet Effective Radius (Re) with Re =Rm*exp(-0.5*sgm**2) where sgm = ln(S).

More complicated cloud droplet distribution (e.g. Bi-model distribution and multi-layer cloud) can be given to rstar6b. See more information in *rstar6b.Readme*.

```
Parameter file for particulate polydispersions (96.3.13 updated)
   0.01E-4    30.0E-4              : Rmin, Rmax (in cm)
   11                              : NMODEL
*    Water (1) Vertical v. conc. (dry, relative unit)
   3.33E-07   3.33E-07   3.33E-07   3.33E-01   3.33E-01
   3.33E-01   3.33E-07   3.33E-07   3.33E-07   3.33E-07
   3.33E-07   3.33E-07   3.33E-07   3.33E-07   3.33E-07
   3.33E-07   3.33E-07   3.33E-07   3.33E-07   3.33E-07
   3.33E-07   3.33E-07   3.33E-07   3.33E-07   3.33E-07
   3.33E-07   3.33E-07   3.33E-07   3.33E-07   3.33E-07
   3.33E-07   3.33E-07   3.33E-07   3.33E-07   3.33E-07
   3.33E-07   3.33E-07   3.33E-07   3.33E-07   3.33E-07
   3.33E-07   3.33E-07   3.33E-07   3.33E-07   3.33E-07
   3.33E-07   3.33E-07   3.33E-07   3.33E-07   3.33E-07
         :
         :
Water (1)
   1          0          0                  : ISPCV (3 component mixture)
   1.00       0          0                  : FRAC (v. fraction)
   1.0E9      10.0       1.1                : nonspherical parameter (x0, G, r)
   1.0                                      : RO (density)
   1                                        : NMODE
   2   1.0000     1.5     8.0E-4      0.0   : parameter packet
   0                                        : NAW
         :
         :
```

Vertical dry particle volume concentration (in relative unit)

Fig.2 An example of *AERDB*

```
# OF MAIN MOLECULES, # OF TRACE GASES, # OF ATMOSPHERS, # OF LEVELS
7   21   6   50
         :
         :
ALT (KM)
 0.0         1.0         2.0         3.0         4.0
 5.0         6.0         7.0         8.0         9.0
10.0        11.0        12.0        13.0        14.0
15.0        16.0        17.0        18.0        19.0
20.0        21.0        22.0        23.0        24.0
25.0        27.5        30.0        32.5        35.0
37.5        40.0        42.5        45.0        47.5
50.0        55.0        60.0        65.0        70.0
75.0        80.0        85.0        90.0        95.0
100.0       105.0       110.0       115.0       120.0
         :
         :
```

Altitude setting

Fig.3 An example of *MLATMD*