

How to run the TOV solver:

% = terminal prompt

> = TOV prompt

[comments] = my comments

... = long print out

You may want to go into TOV.f and change the three open statements and adjust the directories where the EOS, prof.dat and prod.dat file are (prof.dat contains the profile of the star and prod.dat a sequence of stars for a M-R curve)

You may also want to use a lower ipmax = number of models calculated for the prod.dat file.

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### Compilation:

Just do

% gfortran -w -o TOV TOV.f

[The -w is to avoid warnings]

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%TOV

>cgs

[use cgs units]

>eos=' *name and location of the EOS file* '

>geteos

...

...

[will print out the EOS]

...

>go

go

../EOS/APR\_EOS\_Cat.dat

rhoc: 4.0000E-01 radius: 1.1832E+01

masses(g,b,p): 8.510829853E-01 9.086675311E-01 9.326338848E-01

step size: 5.0000E-01 initial step: 1.0000E-02

Here comes another one!

```
>rhoc=0.3
```

[change the central density,, in  $\text{fm}^{-3}$ ]

```
rhoc=0.3
```

```
>go
```

```
go
```

```
../EOS/APR_EOS_Cat.dat
```

```
rhoc: 3.0000E-01 radius: 1.2289E+01
```

```
masses(g,b,p): 5.361964399E-01 5.581938883E-01 5.680384611E-01
```

```
step size: 5.0000E-01 initial step: 1.0000E-02
```

Here comes another one!

```
>targetmass=1.4
```

[in  $M_{\text{Sun}}$ ]

```
targetmass=1.4
```

```
>go
```

```
...
```

```
...
```

```
...
```

```
...
```

```
...
```

```
...
```

```
../EOS/APR_EOS_Cat.dat
```

```
rhoc: 5.4473E-01 radius: 1.1567E+01
```

```
masses(g,b,p): 1.399999989E+00 1.567791722E+00 1.636761753E+00
```

```
step size: 5.0000E-01 initial step: 1.0000E-02
```

Here comes another one!

```
>dump
```

[dump profile in file "Profile/prof.dat" . If the file exists it will tell you !]

```
dump
```

```
>go
```

```
go
```

Profile being output.

../EOS/APR\_EOS\_Cat.dat

rhoc: 5.4473E-01 radius: 1.1567E+01

masses(g,b,p): 1.400000003E+00 1.567791738E+00 1.636761771E+00

step size: 5.0000E-01 initial step: 1.0000E-02

Here comes another one!

>nod

[don't dump profile ! That's the default value]

nod

>production

[will produce a sequence of star with from rhoc=0.1 up to 3.0014 in 10,000 steps !]

production

[be sure to issue 'nod' before this]

>go

go

...

[a VERY long series of output]

...

[The M-R results are in file "Production/prod.dat". If the file already exists it will tell you]

...

...

>

[Get some info: ]

>what?

what?

eos = ../EOS/APR\_EOS\_Cat.dat

>fs?

[TOV uses a Runge-Kutta with adaptative step: fs= first step size]

fs?

9.999999776482582E-003

>ss?

[ss = subsequent step scaling]

ss?

0.5000000000000000

>ss=0.01

[if there is a phase transition with density discontinuity]

ss=0.0

[you need a very small ss to be able to resolve it]

>

[... and so on ...]