The Gyrokinetic Regime
Geometry
Velocity Space
Linear How-To
Units
Non-Linear Issues
Miscellany

# Announcements

- Units for fluxes left out factor of $\rho_r$; this has been fixed in the posted notes.

- Search engine for website (especially useful for searching documentation) is working.

- I've used "frames" for the website. Is anyone using a browser that cannot handle frames? You'll know if you see gobbledygook at `gs2.sourceforge.net`.

# Sample Nonlinear Inputs

- Nonlinear inputs for small nonlinear run

- Discuss choice in detail and look at the report generated by `ingen`

- Layouts are more important for nonlinear runs

- Read from right to left: species, energy, ky, kx, lambda

```
&layouts_knobs
layout='lxyes'
/
```

- Data layouts strongly affect the numbers of processors which will give good performance.

- In this case, `ingen` reports:

```
Number of meshpoints:  20528640
Recommended numbers of processors, time on SP2

 npe =   1   time =  38.70  seconds/time step
 npe =   2   time =  20.03  seconds/time step
 npe =   4   time =  10.37  seconds/time step
 npe =  10   time =   4.34  seconds/time step
 npe =  20   time =   2.25  seconds/time step
 npe =  40   time =   1.16  seconds/time step
 npe =  60   time =   0.79  seconds/time step
 npe = 120   time =   0.41  seconds/time step
```

# Meshpoints

- Energy grids:

```
&le_grids_knobs   ngauss = 5, negrid = 10, ecut= 5.0/
```

- Perpendicular spatial grids:

```
&kt_grids_box_parameters
ny = 18, nx = 32, y0 = 10., jtwist = 10/
```

- Geometry, $\theta$ grid:

```
&theta_grid_parameters   ntheta= 32, nperiod= 1
eps = 0.18, epsl = 2.0, pk = 1.44, shat = 0.8/
```

# Initial Conditions

- Including specification of restart file:

```
&init_g_knobs
chop_side = .false.
phiinit = 1.e-3, restart_file = "nc/pf01.nc"
ginit_option="many", ginit_option= "noise" /
```

- Note repeated items okay; last instance used.

# Control Knobs for Nonlinear Terms

- Can leave out `flow_mode` here

```
&nonlinear_terms_knobs
flow_mode = 'off'
nonlinear_mode='on'
cfl = 0.2
/
```

- `cfl` controls the time step; smaller is more conservative.

# Time Step Adjustment

- Increments by which time step is changed controlled by `delt_adj`:
  &reinit_knobs
  delt_adj = 2.0, delt_minimum = 1.e-4/

- At every timestep, the maximum perpendicular velocity on the in the simulation domain is found and compared with the CFL condition.

- When there is a violation, the time step is reduced by a factor of `delt_adj`; when it is safe to do so, $dt$ is increased by the same factor.

# Species Information

```
 Number of species:  2

 Species             1
 Type:               Ion
 Charge:             1.000
 Mass:               1.0000E+00
 Density:            1.000
 Temperature:        1.000
 Collisionality:     0.0000E+00

Normalized Inverse Gradient Scale Lengths:
 Temperature:  6.900
 Density:      2.200
 Parallel v:   0.000
```

# Species Information

```
 Species           2
 Type:             Electron
 Charge:           -1.000
 Mass:             2.7200E-04
 Density:          1.000
 Temperature:      1.000
 Collisionality:   0.0000E+00

Normalized Inverse Gradient Scale Lengths:
 Temperature:  6.900
 Density:      2.200
 Parallel v:   0.000
```

---

```
 Calculated Z_eff:  1.000
```

# Interpretative Information

- `ingen` attempts to rephrase your choices:

```
Scale lengths are normalized to the major radius, R
The safety factor q = 1.3889
The magnetic shear s_hat = 0.8000
and epsilon ≡ r/R = 0.1800

Trapped particles are included.
```

# More Interpretative Info

A rectangular simulation domain has been selected.

The domain is 62.8319 $\rho$ in the $y$ direction.
At $\theta = 0$, the domain is 125.0000 $\rho$ in the $x$ direction.

The nonlinear terms will be evaluated on a grid with 32 points
in $x$ and 18 points in $y$.

After de-aliasing, there will be 6 $k_y \geq 0$ modes and 21 $k_x$ modes.
The modes with $k_y < 0$ are determined by the reality condition.