HANDS-ON SESSION
DRAGON

Equation

$$\nabla \cdot (\vec{J}_i - \vec{v}_w N_i) + \frac{\partial}{\partial p}\left[p^2 D_{pp} \frac{\partial}{\partial p}\left(\frac{N_i}{p^2}\right)\right] - \frac{\partial}{\partial p}\left[\dot{p} N_i - \frac{p}{3}\left(\vec{\nabla} \cdot \vec{v}_w\right) N_i\right] =$$
$$Q + \sum_{i<j}\left(c\beta n_{\text{gas}}\,\sigma_{j\to i} + \frac{1}{\gamma\tau_{j\to i}}\right) N_j - \left(c\beta n_{\text{gas}}\,\sigma_i + \frac{1}{\gamma\tau_i}\right) N_i$$

[arXiv:1607.07886]

Equation

$$\boxed{\nabla \cdot (\vec{J}_i - \vec{v}_w N_i)} + \frac{\partial}{\partial p}\left[p^2 D_{pp} \frac{\partial}{\partial p}\left(\frac{N_i}{p^2}\right)\right] - \frac{\partial}{\partial p}\left[\dot{p} N_i - \frac{p}{3}\left(\vec{\nabla} \cdot \vec{v}_w\right) N_i\right] =$$
$$Q + \sum_{i<j}\left(c\beta n_{\mathrm{gas}}\, \sigma_{j\to i} + \frac{1}{\gamma \tau_{j\to i}}\right) N_j - \left(c\beta n_{\mathrm{gas}}\, \sigma_i + \frac{1}{\gamma \tau_i}\right) N_i$$

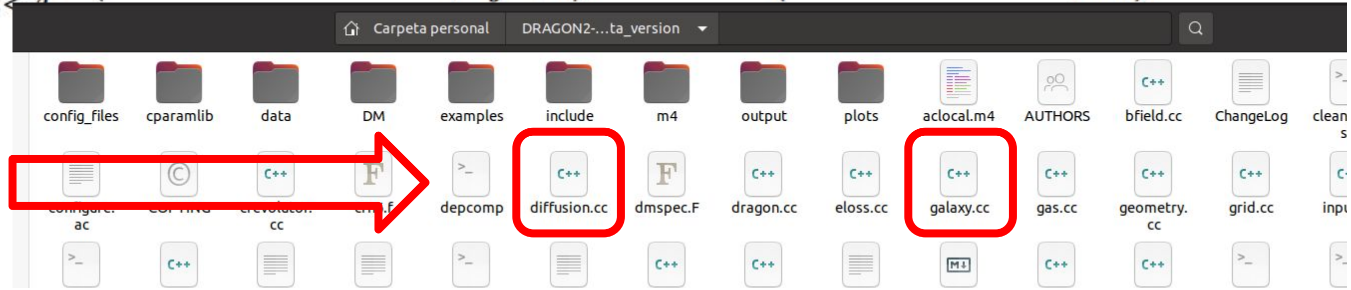
Diffusion and advection

Equation

$$\boxed{\nabla \cdot \left(\vec{J}_i - \vec{v}_w N_i\right)} + \frac{\partial}{\partial p}\left[p^2 D_{pp} \frac{\partial}{\partial p}\left(\frac{N_i}{p^2}\right)\right] - \frac{\partial}{\partial p}\left[\dot{p} N_i - \frac{p}{3}\left(\vec{\nabla} \cdot \vec{v}_w\right) N_i\right] =$$

$$Q + \sum_{j<i}\left(c\beta n_{\mathrm{gas}}\, \sigma_{j\to i} + \frac{1}{\gamma \tau_{j\to i}}\right) N_j - \left(c\beta n_{\mathrm{gas}}\, \sigma_i + \frac{1}{\gamma \tau_i}\right) N_i$$

Diffusion and advection



Equation

$$\nabla \cdot (\vec{J}_i - \vec{v}_w N_i) + \boxed{\frac{\partial}{\partial p}\left[p^2 D_{pp} \frac{\partial}{\partial p}\left(\frac{N_i}{p^2}\right)\right]} - \frac{\partial}{\partial p}\left[\dot{p} N_i - \frac{p}{3}\left(\vec{\nabla} \cdot \vec{v}_w\right) N_i\right] =$$

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Momentum diffusion -
2nd order Fermi
acceleration

Equation

$$\nabla \cdot (\vec{J}_i - \vec{v}_w N_i) + \frac{\partial}{\partial p}\left[p^2 D_{pp} \frac{\partial}{\partial p}\left(\frac{N_i}{p^2}\right)\right] - \boxed{\frac{\partial}{\partial p}\left[\dot{p} N_i - \frac{p}{3}\left(\vec{\nabla} \cdot \vec{v}_w\right) N_i\right]} =$$

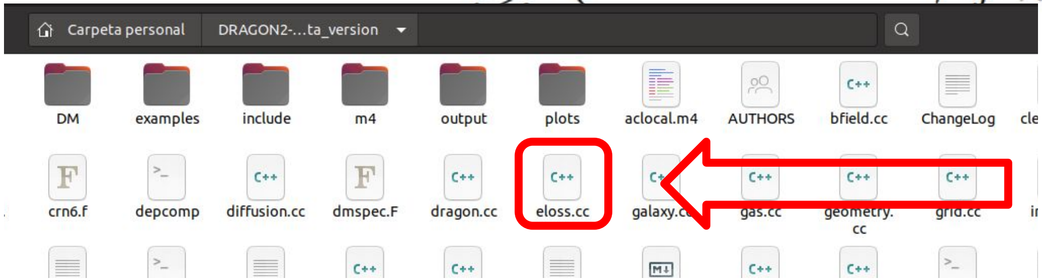
$$Q + \sum_{i<j}\left(c\beta n_{\text{gas}}\,\sigma_{j\to i} + \frac{1}{\gamma\tau_{j\to i}}\right) N_j - \left(c\beta n_{\text{gas}}\,\sigma_i + \frac{1}{\gamma\tau_i}\right) N_i$$

Energy losses and
adiabatic losses

Equation

$$\nabla \cdot (\vec{J}_i - \vec{v}_w N_i) + \frac{\partial}{\partial p}\left[p^2 D_{pp} \frac{\partial}{\partial p}\left(\frac{N_i}{p^2}\right)\right] - \boxed{\frac{\partial}{\partial p}\left[\dot{p} N_i - \frac{p}{3}\left(\vec{\nabla} \cdot \vec{v}_w\right) N_i\right]} =$$

$$Q + \sum \left(c\beta n_{\rm gas}\, \sigma_{j\to i} + \frac{1}{\gamma \tau_{j\to i}}\right) N_j - \left(c\beta n_{\rm gas}\, \sigma_i + \frac{1}{\gamma \tau_i}\right) N_i$$



Energy losses and adiabatic losses

Equation

$$\nabla \cdot (\vec{J}_i - \vec{v}_w N_i) + \frac{\partial}{\partial p}\left[p^2 D_{pp} \frac{\partial}{\partial p}\left(\frac{N_i}{p^2}\right)\right] - \frac{\partial}{\partial p}\left[\dot{p} N_i - \frac{p}{3}\left(\vec{\nabla} \cdot \vec{v}_w\right) N_i\right] =$$

$$\boxed{Q} + \sum_{i<j}\left(c\beta n_{\mathrm{gas}}\, \sigma_{j\to i} + \frac{1}{\gamma \tau_{j\to i}}\right) N_j - \left(c\beta n_{\mathrm{gas}}\, \sigma_i + \frac{1}{\gamma \tau_i}\right) N_i$$

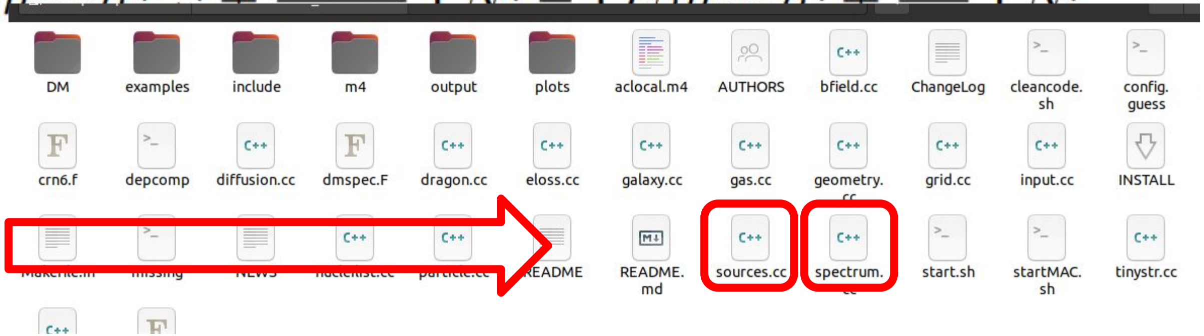
Source term

Equation

$$\nabla \cdot \left(\vec{J}_i - \vec{v}_w N_i\right) + \frac{\partial}{\partial p}\left[p^2 D_{pp} \frac{\partial}{\partial p}\left(\frac{N_i}{p^2}\right)\right] - \frac{\partial}{\partial p}\left[\dot{p} N_i - \frac{p}{3}\left(\vec{\nabla}\cdot\vec{v}_w\right) N_i\right] =$$

$$\boxed{Q} + \sum_{i<j}\left(c\beta n \ldots \sigma \ldots + \frac{1}{\ldots}\right) N \ldots - \left(c\beta n \ldots \sigma \ldots + \frac{1}{\ldots}\right) N \ldots$$

Source term



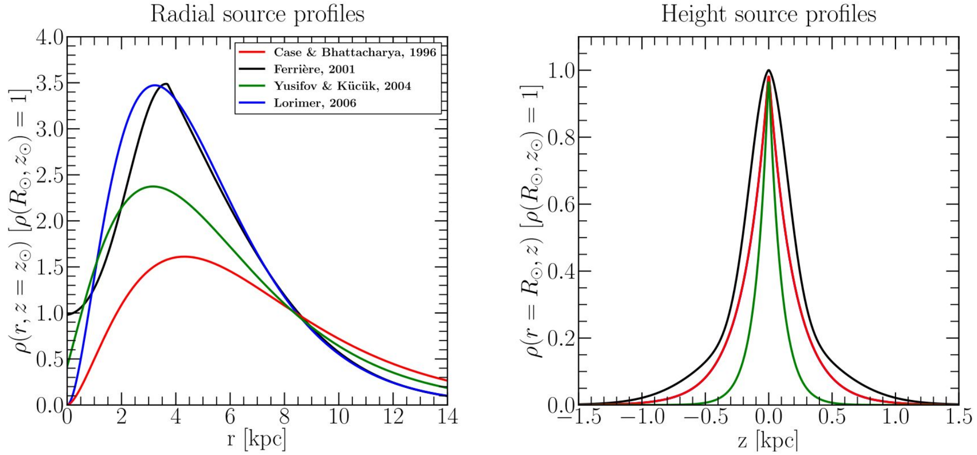
Equation

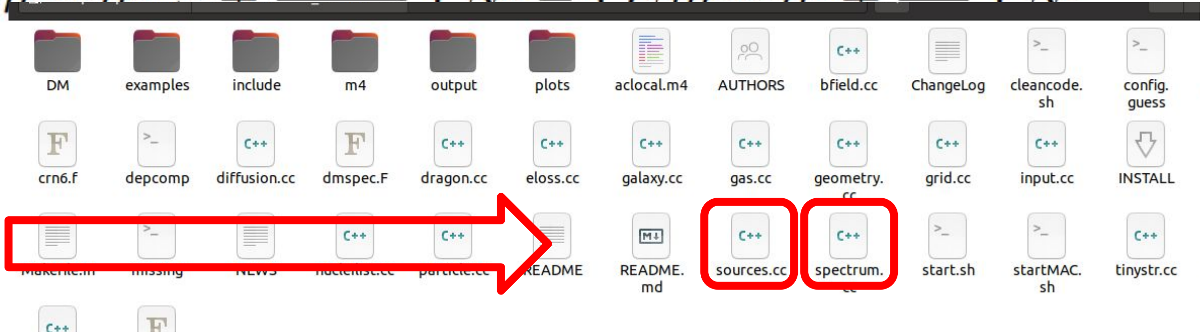
$$\nabla \cdot (\vec{J}_i - \vec{v}_w N_i) + \frac{\partial}{\partial p}\left[p^2 D_{pp} \ldots\right.$$

$$\boxed{Q} + \sum_{i<j} \left(c\beta n \ldots \right) N_j - \left(c\beta n \ldots \right) N_i$$

Source term

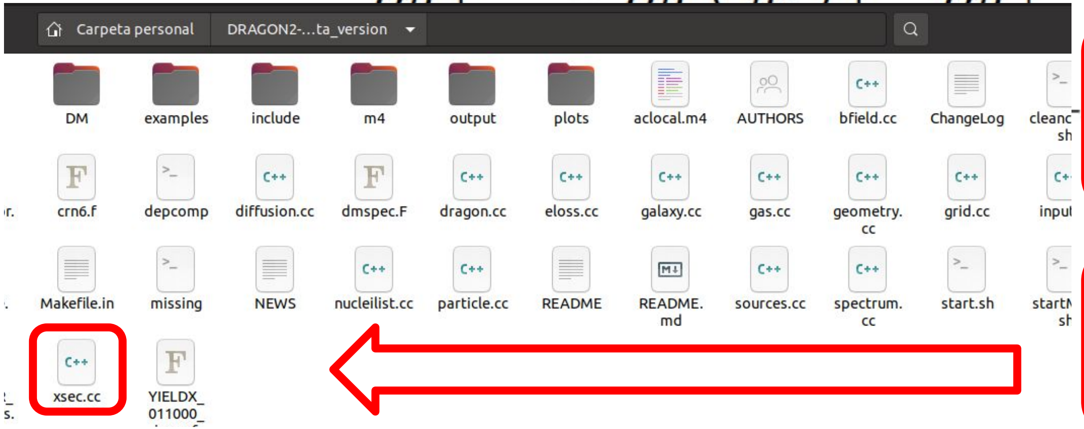
[arXiv:1607.07886]





Equation

$$\nabla \cdot \left(\vec{J}_i - \vec{v}_w N_i\right) + \frac{\partial}{\partial p}\left[p^2 D_{pp} \frac{\partial}{\partial p}\left(\frac{N_i}{p^2}\right)\right] - \frac{\partial}{\partial p}\left[\dot{p} N_i - \frac{p}{3}\left(\vec{\nabla} \cdot \vec{v}_w\right) N_i\right] = \boxed{\left(c\beta n_{\mathrm{gas}}\, \sigma_i + \frac{1}{\gamma \tau_i}\right) N_i}$$



Spallation and decay of particles

Equation

$$\nabla \cdot (\vec{J}_i - \vec{v}_w N_i) + \frac{\partial}{\partial p}\left[p^2 D_{pp} \frac{\partial}{\partial p}\left(\frac{N_i}{p^2}\right)\right] - \frac{\partial}{\partial p}\left[\dot{p} N_i - \frac{p}{3}\left(\vec{\nabla} \cdot \vec{v}_w\right) N_i\right] =$$

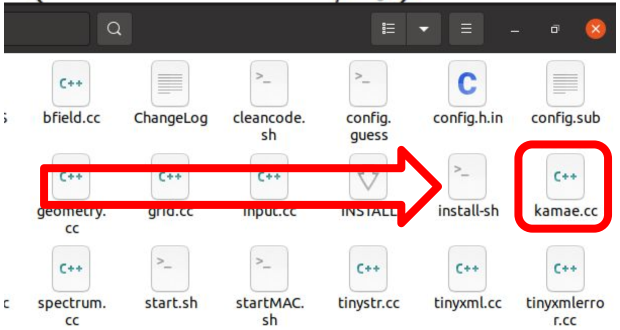
$$Q + \boxed{\sum_{i<j}\left(c\beta n_{\mathrm{gas}}\, \sigma_{j\to i} + \frac{1}{\gamma \tau_{j\to i}}\right) N_j} - \left(c\beta n_{\mathrm{gas}}\, \sigma_i + \frac{1}{\gamma \tau_i}\right) N_i$$

Injection of particles by spallation and decays

Equation

$$\nabla \cdot \left(\vec{J}_i - \vec{v}_w N_i\right) + \frac{\partial}{\partial p}\left[p^2 D_{pp}\,\frac{\partial}{\partial p}\left(\frac{N_i}{p^2}\right)\right] - \frac{\partial}{\partial p}\left[\dot{p} N_i - \frac{p}{3}\left(\vec{\nabla} \cdot \vec{v}_w\right) N_i\right] =$$
$$Q + \boxed{\sum_{i<j}\left(c\beta n_{\mathrm{gas}}\,\sigma_{j\to i} + \frac{1}{\gamma \tau_{j\to i}}\right) N_j} - \left(c\beta n_{\mathrm{gas}}\,\sigma_i + \frac{1}{\gamma \tau_i}\right) N_i$$

Injection of particles by spallation and decays



Simulation setup

Example file: ‘BaseModel_DRAGONxsec.xml’ in the examples folder

Simulation setup

Example file: ‘BaseM

BaseModel_DRAGONxsec.xml
~/DRAGON2-Beta_version/examples

Abrir Guardar

```xml
<?xml version="3.0.2" ?>
<Output>
  <partialstore />  <!-- The code writes the spectrum at Sun position for each species on a FITS file (optional) -->
  <fullstore />    <!-- The code writes the complete (r,z,p) grid of propagated particles for each species on a FITS file (optional) -->
  <feedback value="1" />      <!-- To get the entire output, this value has to be different than 0 -->
</Output>
<Grid type="2D">          <!-- Number of spatial dimensions. Options: 2D, 3D -->
  <Observer>
        <x value="8.3" />
        <y value="0.0" />
        <z value="0.0" />
  </Observer>
  <Rmax value="12" />   <!-- Maximum value of Galactocentric radius (R) in kpc -->
  <L value="4" />       <!-- Halo size in kpc. The Galaxy extends from -L to L -->
  <DimR value="61" />   <!-- Number of grid points along R -->
  <DimZ value="81" />   <!-- Number of grid points along vertical axis -->
  <Ekmin value="0.01" />       <!-- Miminum kinetic energy of propagated particles in GeV -->
  <Ekmax value="100000." />  <!-- Maximum kinetic energy of propagated particles in GeV -->
  <Ekfactor value="1.25" />  <!-- Logaritmic spacing of energy grid. E[i] = exp( ln(Ekmin) + i ln(Ekfactor) ) -->
  <NuclearChain>
    <Zmax value="14" />    <!-- Maximum atomic number of propagated particles -->
    <Zmin value="1" />     <!-- Minimum atomic number of propagated particles -->
    <!PropLepton />         <!-- The code propagates leptonic species (optional) -->
    <!PropExtraComponent /> <!-- Extra source injecting e- and e+ (optional) -->
    <!PropSecAntiProton />  <!-- The code propagates antiprotons (optional) -->
  </NuclearChain>
</Grid>
<Algorithm>
  <OpSplit>
    <!-- The code starts with dt = Dtmax; after Nrept iterations, the code rescales dt by the factor Dtfactor; this process is iterated until Dtmin is reached -->
    <Nrept value="30" />          <!-- Number of iterations before changing timestep -->
    <Dtfactor value=".25" />      <!-- Rescaling factor of the time step     -->
    <Dtmin value="0.001" />       <!-- Minimum time step in Myr -->
    <Dtmax value="64." />         <!-- Maximum time step in Myr -->
  </OpSplit>
</Algorithm>
<Galaxy>
  <Gas type="Galprop" />   <!-- Gas model; options: BronfFerr, NS, Galprop, Uniform -->
  <SNR type="Ferriere" />  <!-- Source distribution for the primary components; options: Lorimer, Galprop, Ferriere, OneRing, Rings -->
  <SNR_Extra type="Ferriere" /> <!-- Source distribution for the extra component; options: the same as SNRType  (optional) -->
  <XCOmode type="SM96" />        <!-- Model for the X_CO factor; options: SM96, galprop_2004, galprop_2010, constant -->
  <Diffusion type="Constant"> <!-- Spatial distribution of the diffusion coefficient; options: Constant, Exp, Qtau -->
    <D0_1e28 value="3.8" />   <!-- Normalization of the diffusion coefficient at reference rigidity DiffRefRig Unit: 10^28 cm^2/s -->
    <DiffRefRig value = "4" /> <!-- Reference rigidity for the normalization of the diffusion coefficient -->
    <Delta value="0.45" />    <!-- Slope of the diffusion coefficient spectrum -->
    <zt value="4" />          <!-- Scale heigth of the diffusion coefficient, useful in Exp mode: D(z) \propto exp(z/zt) (optional) -->
    <etaT value="1." />       <!-- Low energy correction factor of the diffusion coefficient: D \propto beta^etaT  -->
  </Diffusion>
  <Reacceleration type="Ptuskin94"> <!-- Optional block -->
    <vA_kms value="13." />          <!-- Alfvén velocity in km/s -->
  </Reacceleration>
  <!--Convection>                   <!-- Convection block >
      <v0_kms value="0" />
      <dvdz_kmskpc value="0." />
  </Convection-->
  <CrossSection type="DRAGON2" leptopt="Kamae" apopt="GalpropFunction" ApCs="2" />  <!-- Model for cross sections. leptopt is the model for electron and positron production; options: Kamae, GalpropTable -->
  <MagneticField type="Pshirkov"> <!-- Model for the magnetic field. Options: Pshirkov, Farrar, Uniform, Toymodel -->
     <B0disk value="2.e-06" />  <!-- Useful for Pshirkov field: Disk regular field normalization in Gauss -->
     <B0halo value="4.e-06" />  <!-- Useful for Pshirkov field: Halo regular field normalization in Gauss -->
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```

Output

To specify our output files

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<Output>
  <partialstore />  <!-- The code writes the spectrum at Sun position for each species on a FITS file (optional) -->
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</Output>
```

Output

To specify our output files

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<?xml version="3.0.2" ?>
<Output>
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```

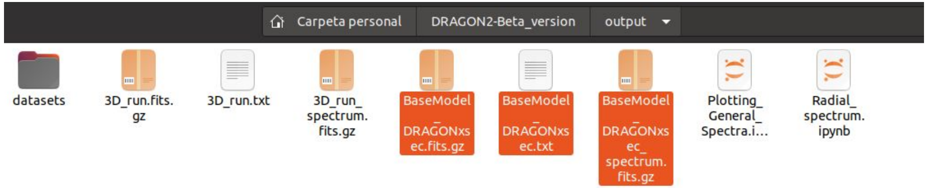

Grid

Design the grid (space, energy, ...) where the simulation will be solved

```
</Output>
<Grid type="2D">            <!-- Number of spatial dimensions. Options: 2D, 3D -->
  <Observer>
        <x value="8.3" />
        <y value="0.0" />
        <z value="0.0" />
  </Observer>
  <Rmax value="12" />   <!-- Maximum value of Galactocentric radius (R) in kpc -->
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    <Zmax value="14" />    <!-- Maximum atomic number of propagated particles -->
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    <!PropSecAntiProton />  <!-- The code propagates antiprotons (optional) -->
  </NuclearChain>
</Grid>
```

And what kind of particles we want to propagate

Solving algorithm

```
<Algorithm>
  <OpSplit>
    <!-- The code starts with dt = Dtmax; after Nrept iterations, the code rescales dt by the factor Dtfactor; this process is iterated until Dtmin is reached -->
    <Nrept value="30" />          <!-- Number of iterations before changing timestep -->
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    <Dtmin value="0.001" />       <!-- Minimum time step in Myr -->
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</Algorithm>
```

OpSplit: more info later

No convergence criterium (already tested for standard runs)

Dtmin must be lower than the smallest timescale in the system

Solving algorithm

```xml
<Algorithm>
  <OpSplit>
    <!-- The code starts with dt = Dtmax; after Nrept iterations, the code rescales dt by the factor Dtfactor;
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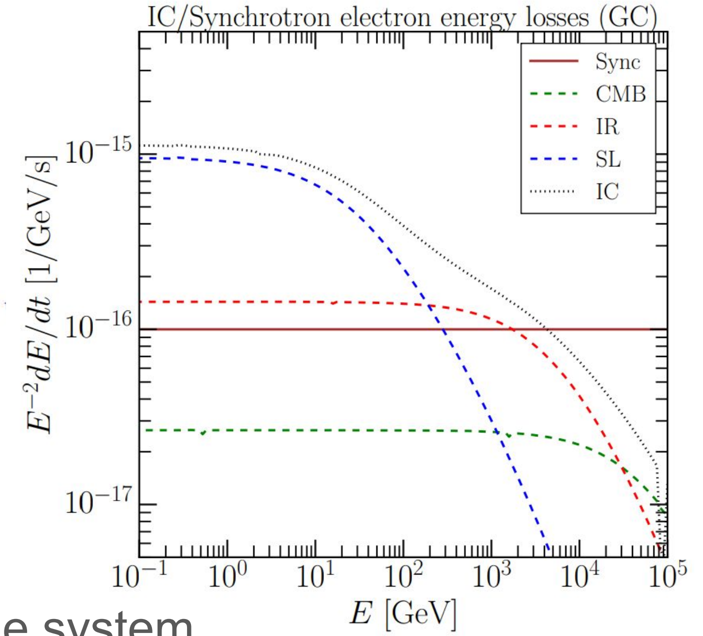

[arXiv:1607.07886]

Dtmin must be lower than the smallest timescale in the system

Exercise: What would Dtmin be for propagating electrons at 100 TeV?

Galaxy setup: gas

```
<Galaxy>
  <Gas type="Galprop" />   <!-- Gas model; options: BronfFerr, NS, Galprop, Uniform -->
  <XCOmode type="SM96" />        <!-- Model for the X_CO factor; options: SM96, galprop_2004, galprop_2010, constant -->
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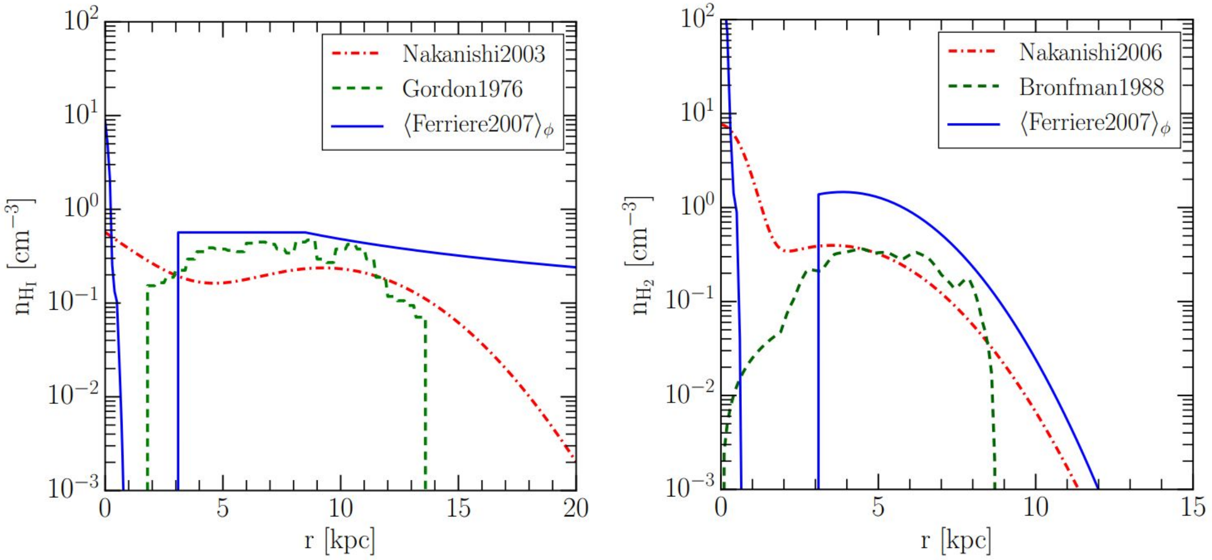

Galaxy setup: source and propagation

```
<Galaxy>
  <Gas type="Galprop" />   <!-- Gas model; options: BronfFerr, NS, Galprop, Uniform -->
  <XCOmode type="SM96" />        <!-- Model for the X_CO factor; options: SM96, galprop_2004, galprop_2010, constant -->
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  <Diffusion type="Constant"> <!-- Spatial distribution of the diffusion coefficient; options: Constant, Exp, Qtau -->
    <D0_1e28 value="3.8" />   <!-- Normalization of the diffusion coefficient at reference rigidity DiffRefRig Unit: 10^28 cm^2/s -->
    <DiffRefRig value = "4" /> <!-- Reference rigidity for the normalization of the diffusion coefficient -->
    <Delta value="0.45" />    <!-- Slope of the diffusion coefficient spectrum -->
    <zt value="4" />          <!-- Scale heigth of the diffusion coefficient, useful in Exp mode: D(z) \propto exp(z/zt) (optional) -->
    <etaT value="1." />       <!-- Low energy correction factor of the diffusion coefficient: D \propto beta^etaT  -->
  </Diffusion>
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Galaxy setup: source and propagation

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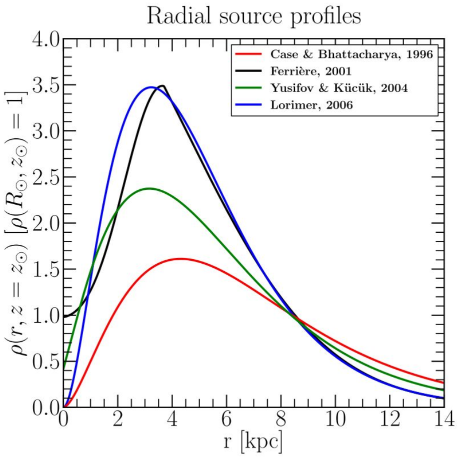

Diffusion:

- constant / spatially dependent
- Isotropic / anisotropic

Galaxy setup: reacceleration and magnetic fields

```
  <Reacceleration type="Ptuskin94"> <!-- Optional block -->
    <vA_kms value="13." />          <!-- Alfvén velocity in km/s -->
  </Reacceleration>
  <!--Convection>                   <!-- Convection block >
      <v0_kms value="0" />
      <dvdz_kmskpc value="0." />
  </Convection-->
  <CrossSection type="DRAGON2" leptopt="Kamae" apopt="GalpropFunction" ApCs="2" />  <!-- Model for cross sections. leptopt is the model for electron and positron production; options: Kamae, GalpropTable -->
  <MagneticField type="Pshirkov"> <!-- Model for the magnetic field. Options: Pshirkov, Farrar, Uniform, Toymodel -->
     <B0disk value="2.e-06" />  <!-- Useful for Pshirkov field: Disk regular field normalization in Gauss -->
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  </MagneticField>
</Galaxy>
```

$$D_{pp} = \frac{4}{3\delta(4-\delta^2)(4-\delta)w}\frac{p^2 v_A^2}{\langle D \rangle}$$

Galaxy setup: reacceleration and magnetic fields

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  <Reacceleration type="Ptuskin94"> <!-- Optional block -->
    <vA_kms value="13." />          <!-- Alfvén velocity in km/s -->
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$$D_{pp} = \frac{4}{3\delta(4-\delta^2)(4-\delta)w}\frac{p^2 v_A^2}{\langle D \rangle}$$

Care with the reacceleration!!

Galaxy setup: reacceleration and magnetic fields

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  </MagneticField>
</Galaxy>
```

$$D_{pp} = \frac{4}{3\delta(4-\delta^2)(4-\delta)w}\frac{p^2 v_A^2}{\langle D \rangle}$$

Care with the reacceleration!!

Convection:

- Constant
- Radial winds

Galaxy setup: reacceleration and magnetic field

```
  <Reacceleration type="Ptuskin94"> <!-- Optional block -->
    <vA_kms value="13." />          <!-- Alfvén velocity in km/s -->
  </Reacceleration>
  <!--Convection>                   <!-- Convection block >
      <v0_kms value="0" />
      <dvdz_kmskpc value="0." />
  </Convection-->
  <CrossSection type="DRAGON2" leptopt="Kamae" apopt="GalpropFunction" ApCs="2" />  <!-- Model for cross sections. leptopt is the model for electron
GalpropTable -->
  <MagneticField type="Pshirkov"> <!-- Model for the magnetic field. Options: Pshirkov, Farrar, Uniform, Toymodel -->
     <B0disk value="2.e-06" />  <!-- Useful for Pshirkov field: Disk regular field normalization in Gauss -->
     <B0halo value="4.e-06" />  <!-- Useful for Pshirkov field: Halo regular field normalization in Gauss -->
     <B0turb value="7.5e-06" /> <!-- Useful for Pshirkov field: Turbulent regular field normalization in Gauss -->
  </MagneticField>
</Galaxy>
```

$$D_{pp} = \frac{4}{3\delta(4-\delta^2)(4-\delta)w}\frac{p^2 v_A^2}{\langle D \rangle}$$

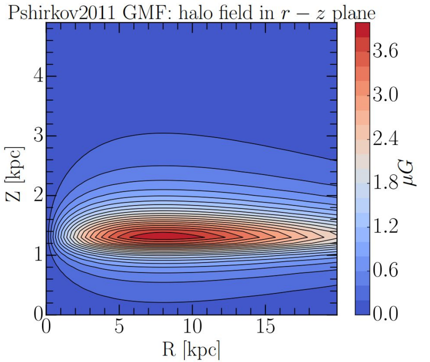
Care with the reacceleration!!

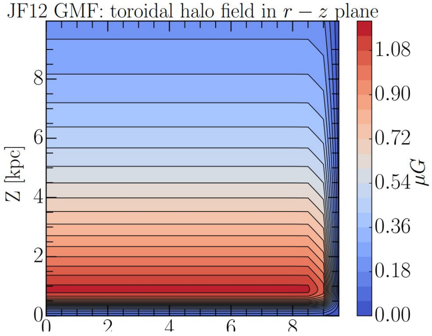
Convection:

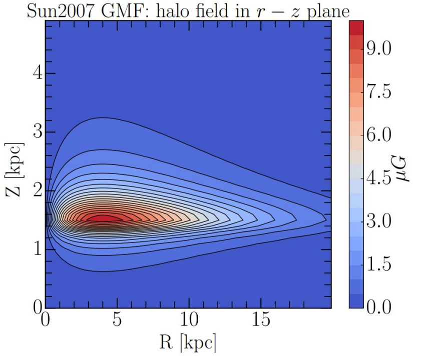
- Constant
- Radial winds

Magnetic fields:

- Pshirkov
- Farrar
- Sun







Injection of particles

We need to set the normalization of the different particle species

```
<CR>
  <ProtNormEn_GeV value="53.645" />  <!-- Reference energy for nuclei normalization in GeV -->
  <ElNormEn_GeV value="33." />   <!-- Reference energy for primary electron normalization in GeV -->
  <ProtNormFlux value="2.57e-1" />  <!-- Proton flux at reference energy   for normalization; in DRAGON units: GeV^-1 m^-2 s^-1 sr^-1 -->
  <ElNormFlux value="0.0046" />   <!-- Electron flux at reference energy for normalization; in DRAGON units: GeV^-1 m^-2 s^-1 sr^-1 -->
  <ElNormEnExtra_GeV value="20." />     <!-- Reference energy for primary electron extra component normalization in GeV -->
  <ElNormFluxExtra value="2.3e-03" />  <!-- Extra component flux at reference energy; in DRAGON units: GeV^-1 m^-2 s^-1 sr^-1 -->
```

Injection of particles: normalization

We need to set the normalization of the different particle species

```
<CR>
  <ProtNormEn_GeV value="53.645" />  <!-- Reference energy for nuclei normalization in GeV -->
  <ElNormEn_GeV value="33." />   <!-- Reference energy for primary electron normalization in GeV -->
  <ProtNormFlux value="2.57e-1" />  <!-- Proton flux at reference energy   for normalization; in DRAGON units: GeV^-1 m^-2 s^-1 sr^-1 -->
  <ElNormFlux value="0.0046" />   <!-- Electron flux at reference energy for normalization; in DRAGON units: GeV^-1 m^-2 s^-1 sr^-1 -->
  <ElNormEnExtra_GeV value="20." />     <!-- Reference energy for primary electron extra component normalization in GeV -->
  <ElNormFluxExtra value="2.3e-03" />  <!-- Extra component flux at reference energy; in DRAGON units: GeV^-1 m^-2 s^-1 sr^-1 -->
```

The code runs with arbitrary units. After the particles are propagated, the code normalizes them to the measured value at the Earth

Injection of particles: spectral shape

In general: broken power laws

```
<InjectionIndexElectrons> <!-- You can add an arbitrary number of breaks!! -->
    <alpha_0 value="1.6" /> <!-- First injection slope for electrons -->
    <rho_0 value="1." />   <!-- Position of first break (rigidity) in GV -->
    <alpha_1 value="1.6" />
    <rho_1 value="5." />
    <alpha_2 value="1.6" />
    <rho_2 value="7." />
    <alpha_3 value="2.7" />
    <CutoffRigEl value="1000." />
</InjectionIndexElectrons>
<!-- ************************** -->
<InjectionIndexExtraComponent>
     <rho_0 value="1." />
     <alpha_0 value="2.28" />
     <rho_0 value="7." />
     <alpha_1 value="2.4" />
     <CutoffRigExtra value="1000." />
</InjectionIndexExtraComponent>
<!-- ************************** -->
</CR>
```

This method is used for electrons and extra component

Injection of nuclei: SAME_NAME_XML.source.param

Columns:

nuclei ID = Z*1000 + A

Normalization

Slope 0

Break 0

Slope 1

Break 1

Slope 2

Abrir Guardar

*BaseModel_DRAGONxsec.source.param
~/DRAGON2-Beta_version/examples

1001	1.06e+06	2.	7.	2.40	335	2.26
2003	9.033	2.3	7.	2.36	200	2.15
2004	85000	2.3	7.	2.36	200	2.15
3006	0	2.3	7.	2.36	200	2.15
3007	0	2.3	7.	2.36	200	2.15
4007	0	2.3	7.	2.36	200	2.15
4009	0	2.3	7.	2.36	200	2.15
4010	0	2.3	7.	2.36	200	2.15
5010	0	2.3	7.	2.36	200	2.15
5011	0	2.3	7.	2.36	200	2.15
6012	3150	2.3	7.	2.36	200	2.15
6013	0	2.3	7.	2.36	200	2.15
6014	0	2.3	7.	2.36	200	2.15
7014	229	2.3	7.	2.36	200	2.15
7015	0	2.3	7.	2.36	200	2.15
8016	4000	2.3	7.	2.36	200	2.15
8017	0	2.3	7.	2.36	200	2.15
8018	0	2.3	7.	2.36	200	2.15
9019	0	2.35	7.	2.42	200	2.24
10020	765	2.35	7.	2.42	200	2.24
10021	0	2.35	7.	2.42	200	2.24
10022	100.1	2.35	7.	2.42	200	2.24
11022	0	2.35	7.	2.42	200	2.24
11023	22.84	2.35	7.	2.42	200	2.24
12024	950.	2.35	7.	2.42	200	2.24
12025	82.5	2.35	7.	2.42	200	2.24
12026	104.7	2.35	7.	2.42	200	2.24
13026	0	2.35	7.	2.42	200	2.24
13027	76.42	2.35	7.	2.42	200	2.24
14028	850.	2.35	7.	2.42	200	2.24