# Motion of atomic nuclei in Galactic magnetic field

We use a simple method to model a propagation of cosmic rays in a wide range of energy (from 1e13 eV to the value 1e19 eV).

→

Escaping of atomic nuclei from the Galaxy

Trajectories were obtained by numerical integration.

## Equation of motion

$$\vec{F} = q\,(\vec{v} \times \vec{B})$$

Lorentz force on a particle with a charge q moving with a velocity **v** in a magnetic field B.

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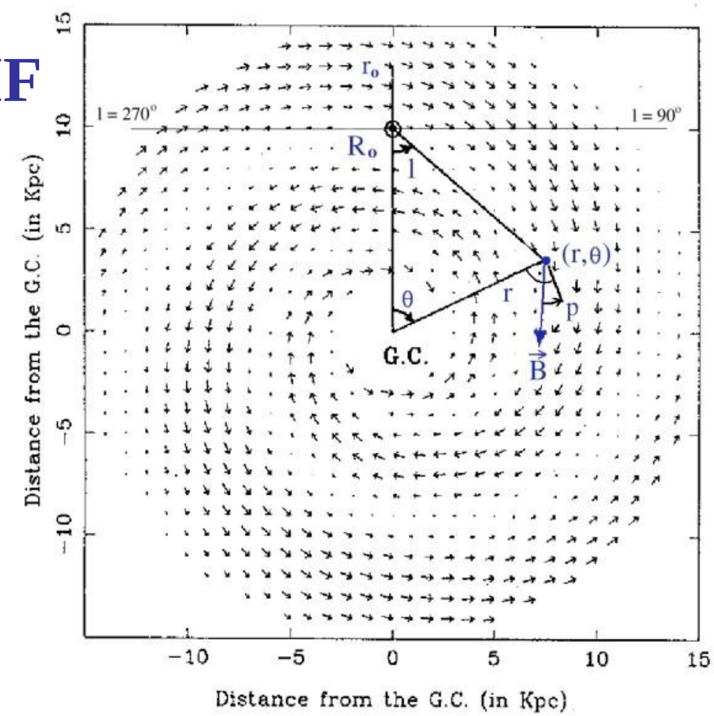
# Magnetic field in the Galaxy

## 1) Regular component - global GMF

• Bisymmetric model with spiral structure (Han & Qiao, 1994)
• We have made (with M. Prouza) our model of poloidal (magnetic dipole) and toroidal field (in Galactic halo).




## 2) Turbulent components
(are not included within global GMF)

From observations we know that have following properties:
• small length scale ( < 150 pc)
• even three times stronger
• random orientation

**We have modelled them by the cells located in random positions, which have turbulent field inside (random strength and orientation).**

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# Starting conditions

- **Chemical composition (Wiebel-Sooth et al., 1998)**

The abundance of the representative elements of each interval of atomic mass at energy equal to 1e12 eV:
**42% H, 26% He,**
**13% C, 9% Mg, 10% Fe**

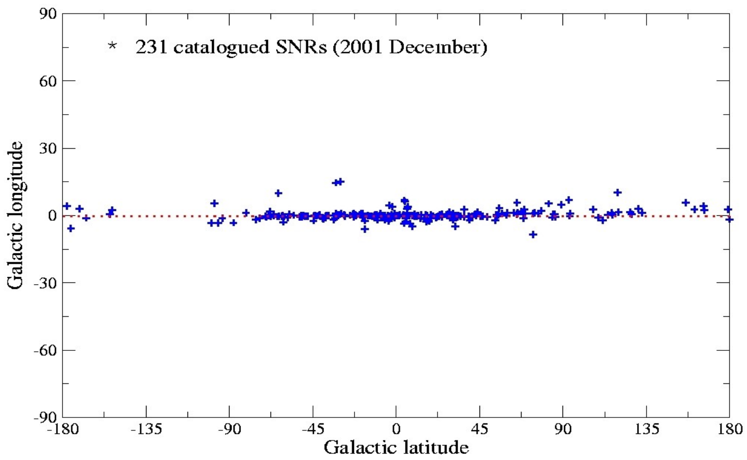
- **Position**

We know that **Supernovae Remnants** are sources of CRs below 1e16 eV and they lies close to Galactic plane.

↓

**Starting positions in Galactic plane.**

The positions of Galactic Supernova Remnants

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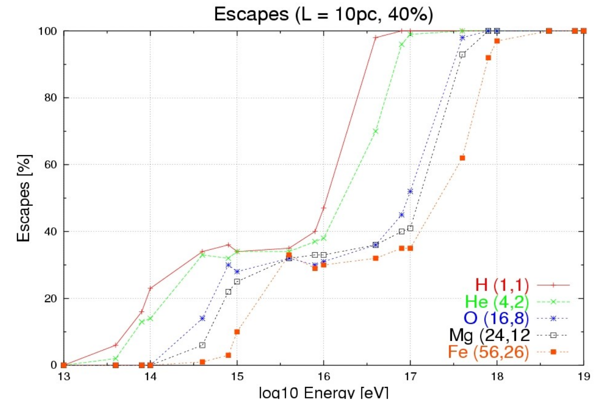
# Results of computer modelling

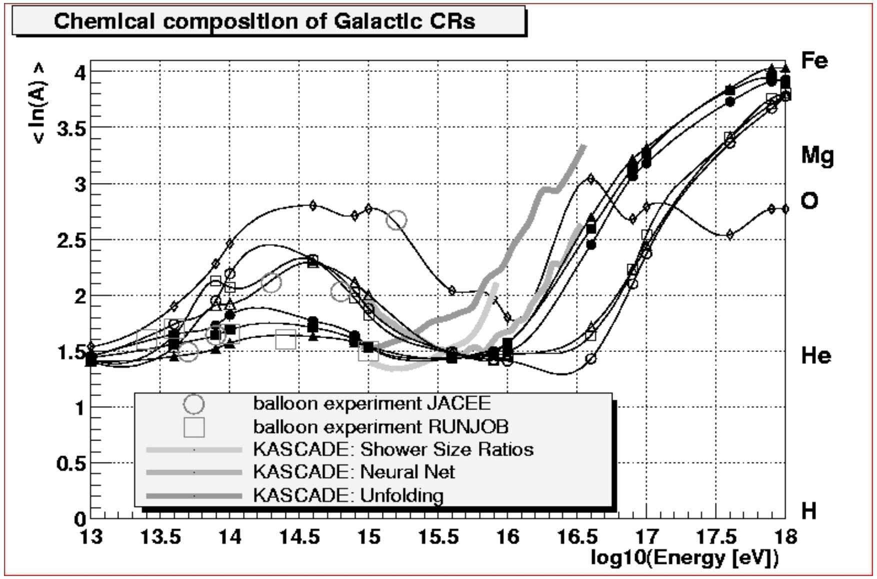
- Change around **1e16 eV** in flux of particles (close to the position of well-known observed feature in energy spectra known as a **knee**)

- All nuclei with energy higher than **1e18 eV** escaped from Galaxy




- Change of the **chemical composition** above position of the knee

**Nice agreement with experiments.**

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Thank you for your attention!