

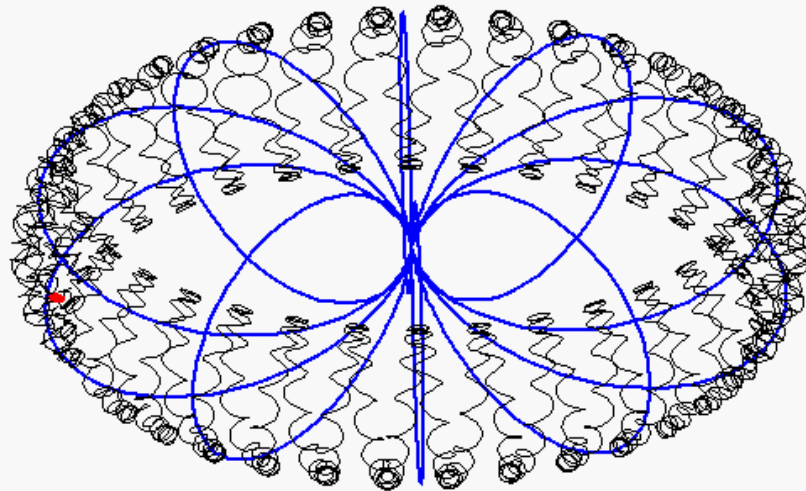
UiO : **Department of Physics**  
University of Oslo

# Pre-midterm wrapup



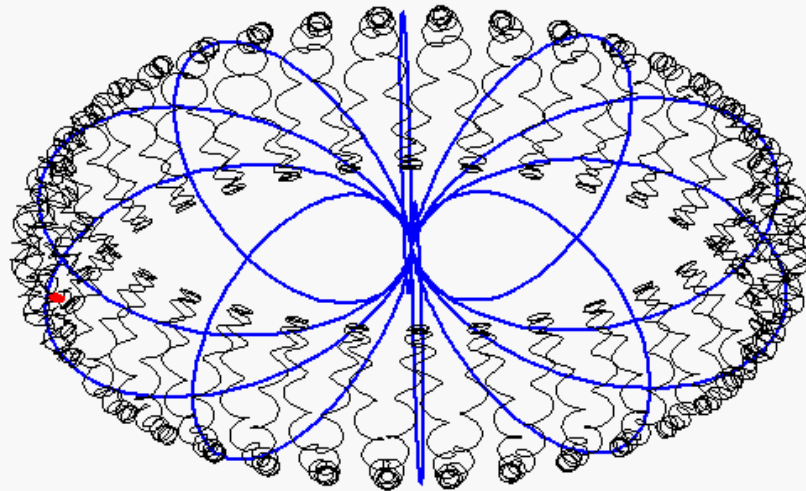
# Single particle motion

$$\begin{aligned} m &= 16\text{amu}, q = 1e \\ T_{\parallel} &= 14\text{MeV}, T_{\perp} = 31\text{MeV}, \alpha_0 = 56^\circ \\ t &= 0.00\text{s} \end{aligned}$$



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# Diffusion vs. frozen-in

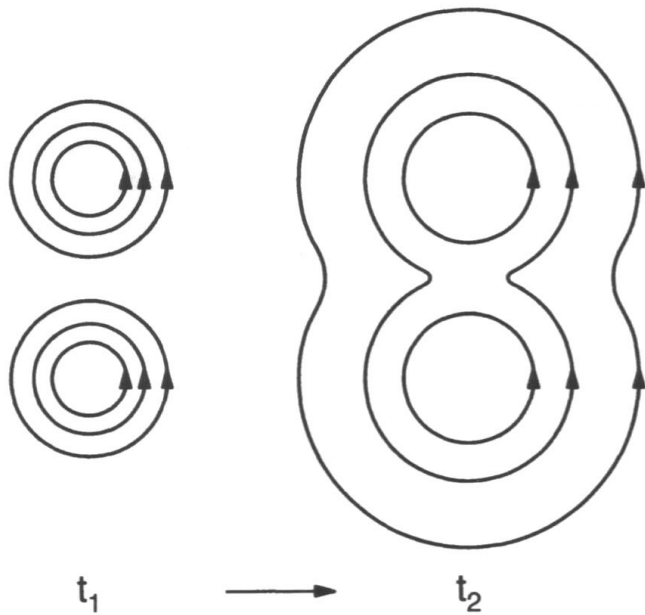
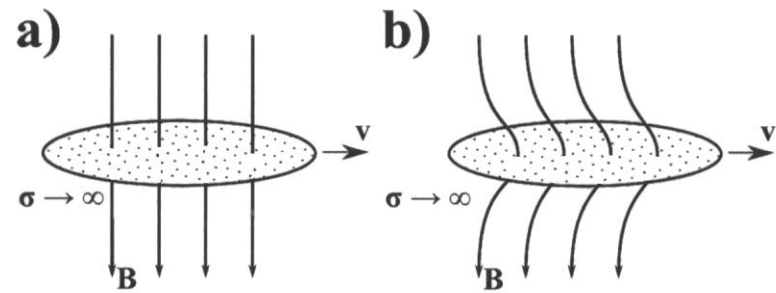


Fig. 5.1. Diffusion of magnetic field lines.



**Figure 1.2:** Illustration of the "frozen-in" theorem. **a)** A magnetic field penetrates a highly conducting plasma. **b)** As the plasma moves, the magnetic field is "frozen-in" and follows the motion of the plasma.



# Magnetic reconnection

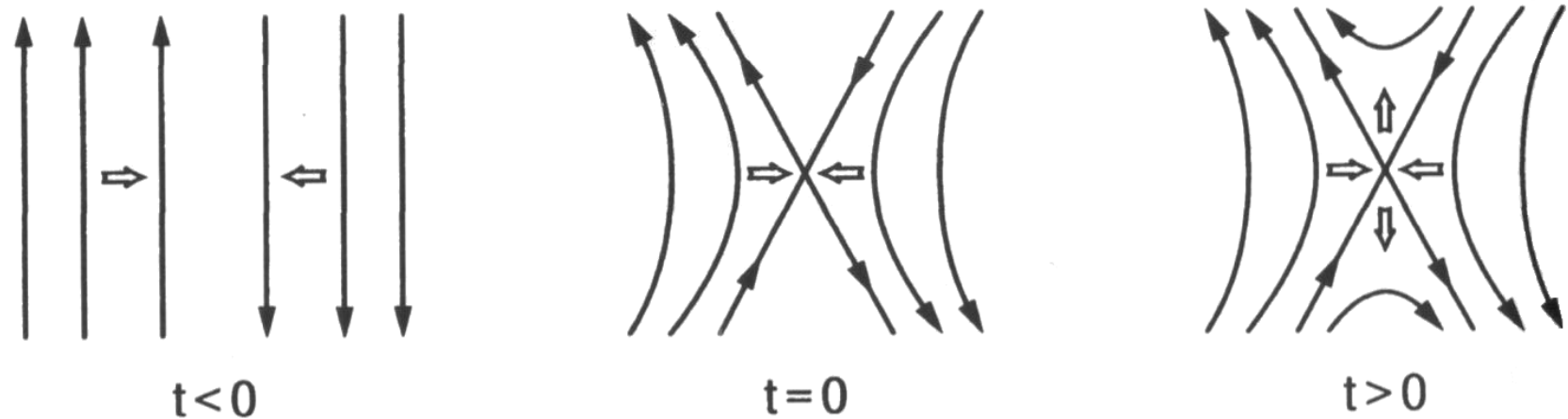
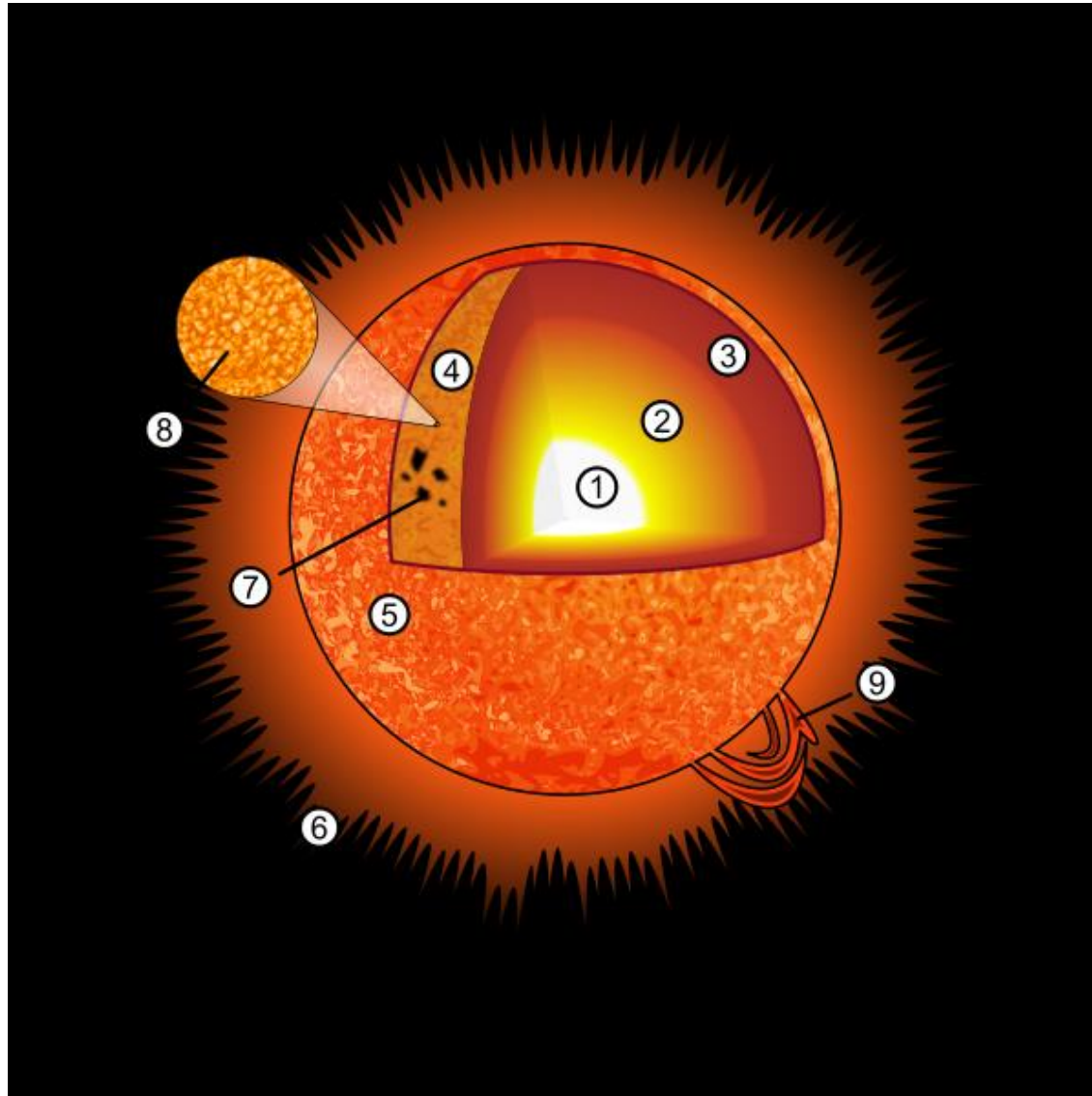


Fig. 5.3. Evolution of field line merging.

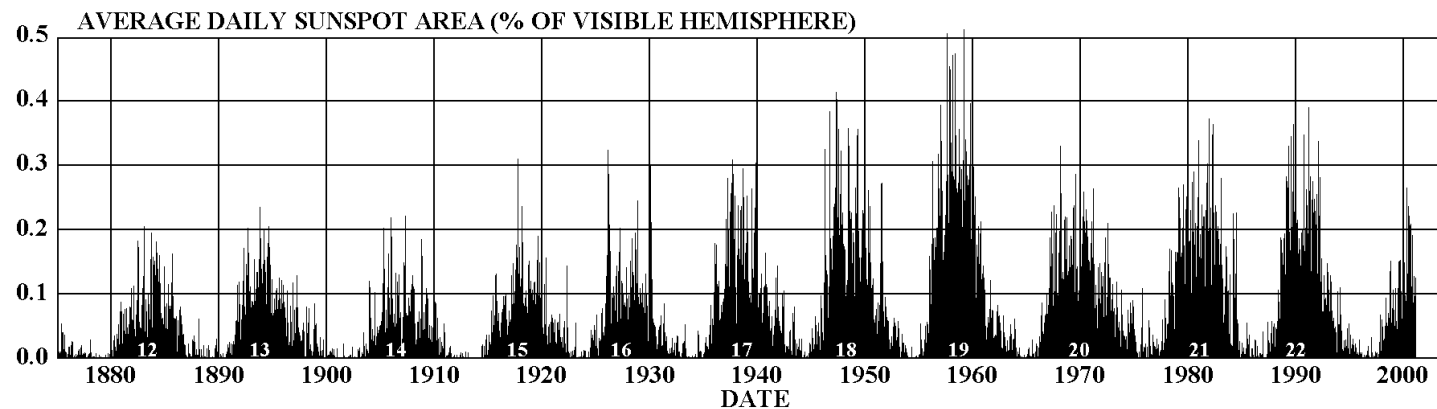
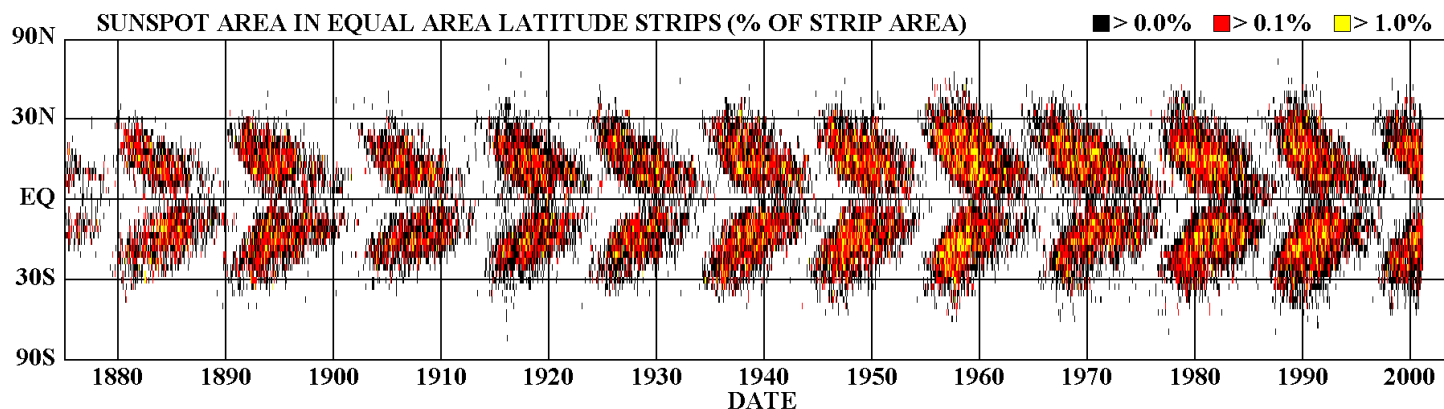


# Some solar features



# Butterfly diagram

## DAILY SUNSPOT AREA AVERAGED OVER INDIVIDUAL SOLAR ROTATIONS

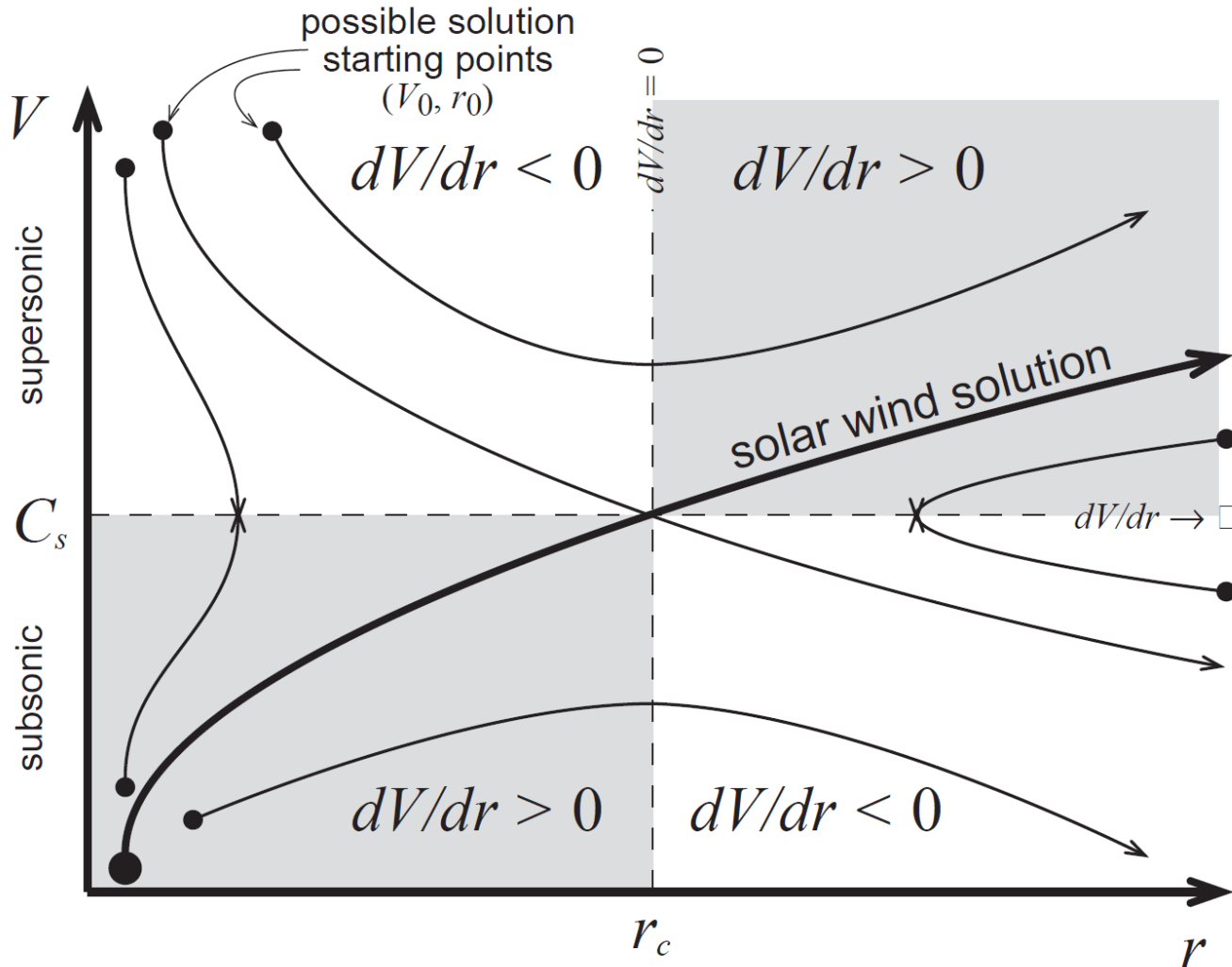


<http://science.msfc.nasa.gov/ssl/pad/solar/images/bfly.gif>

NASA/MSFC/HATHAWAY 02/2001

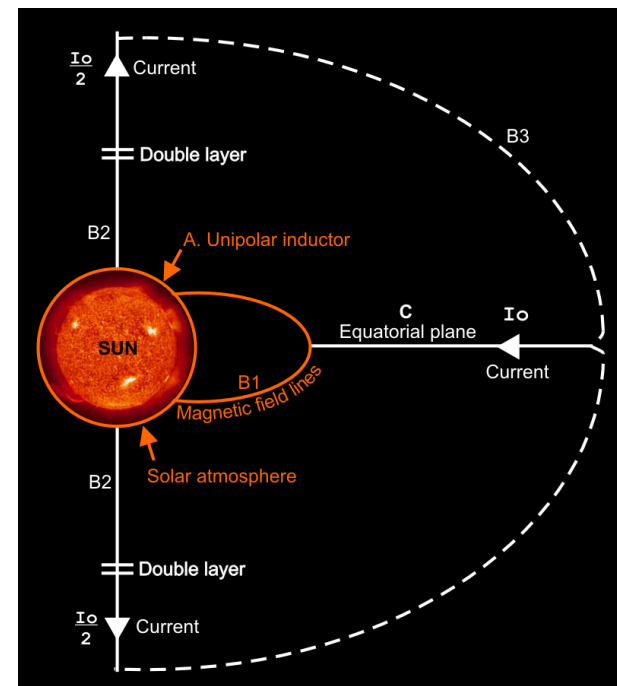
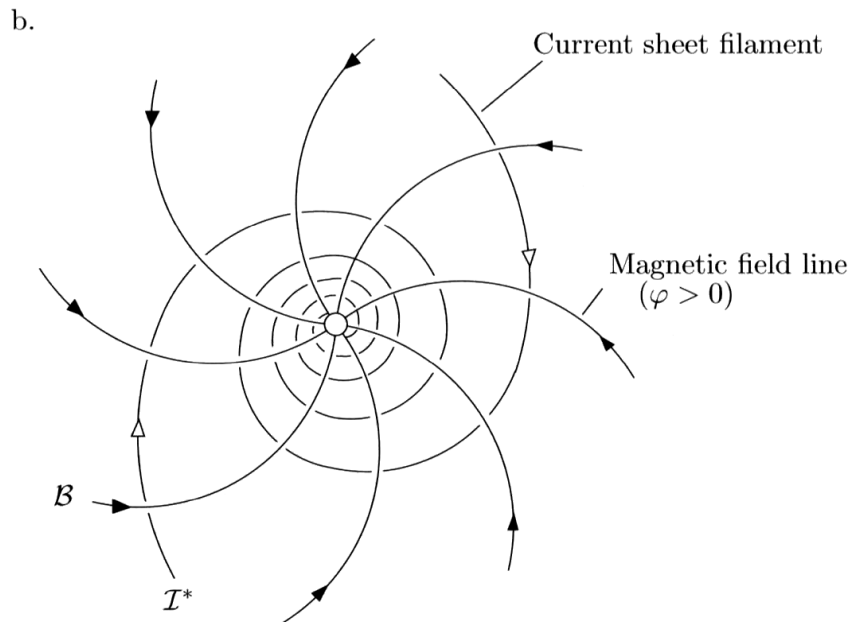
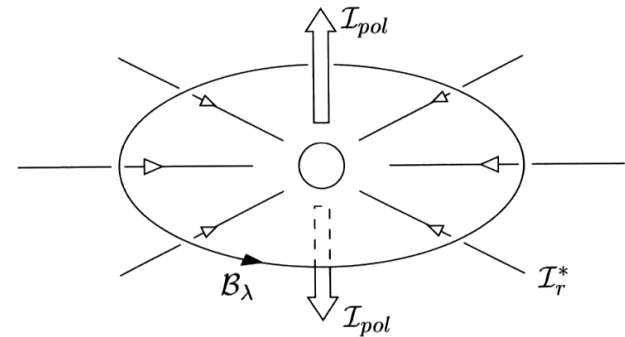
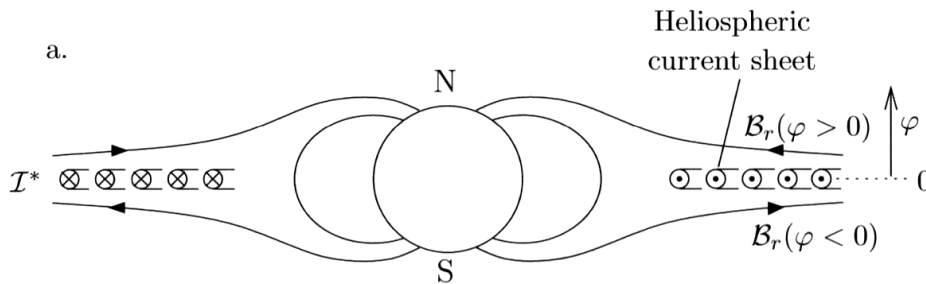


# Gas dynamic model II

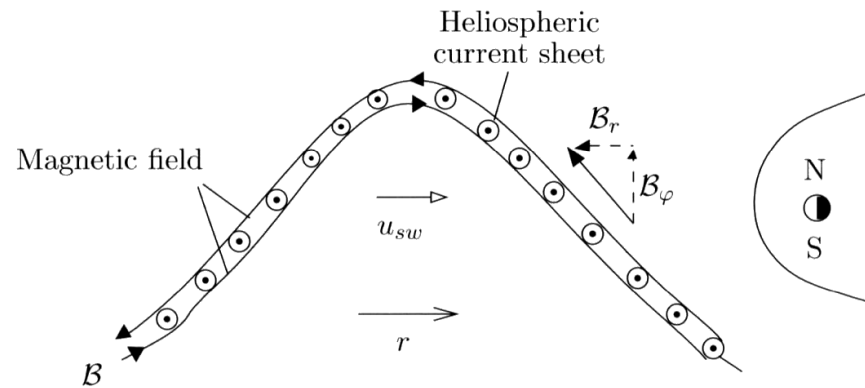
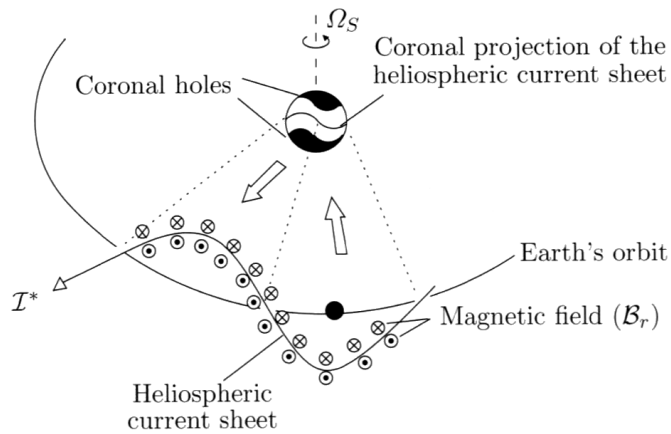
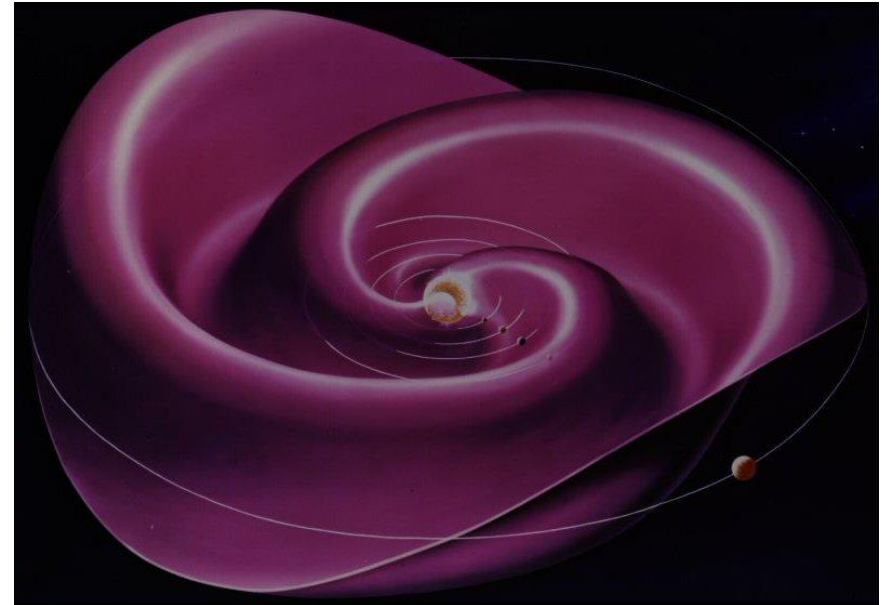
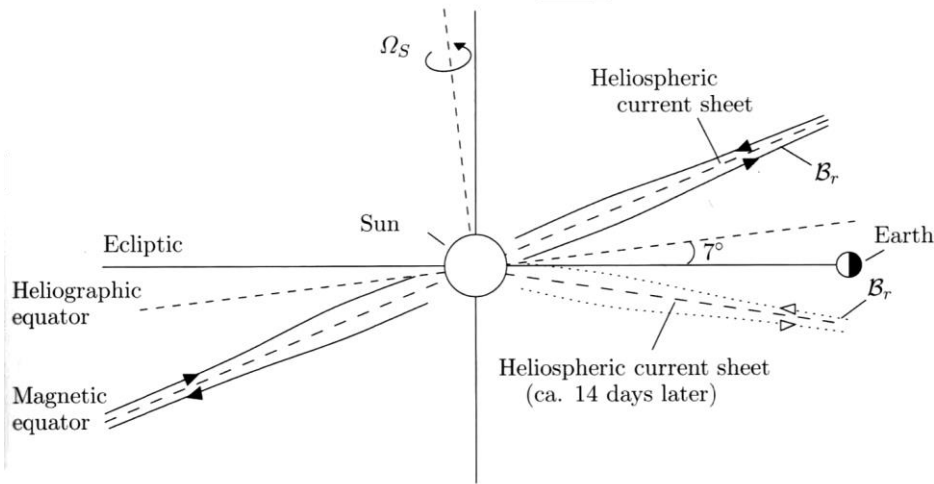




# Heliospheric current circuit



# Ballerina skirt



# Dayside magnetosphere

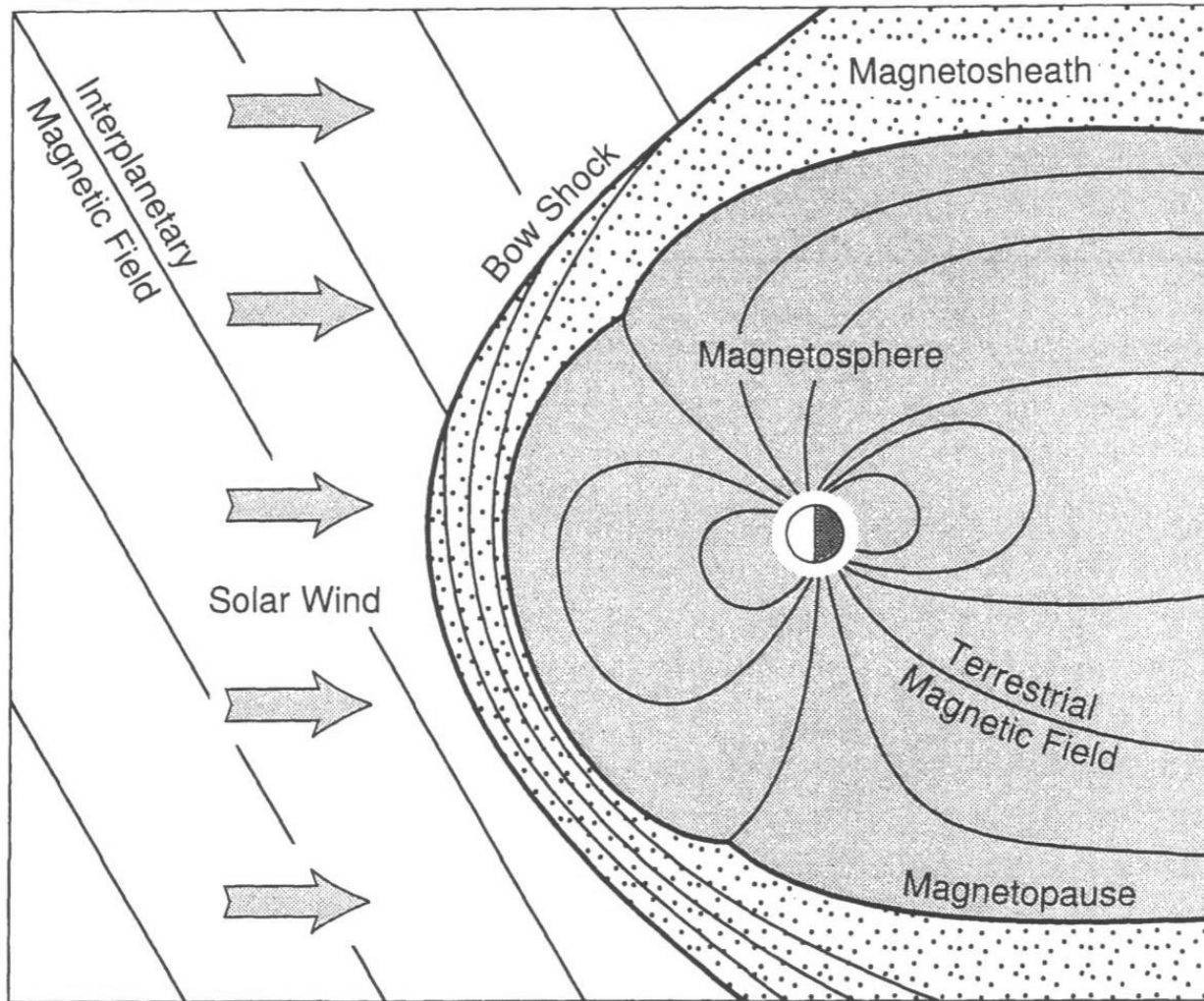
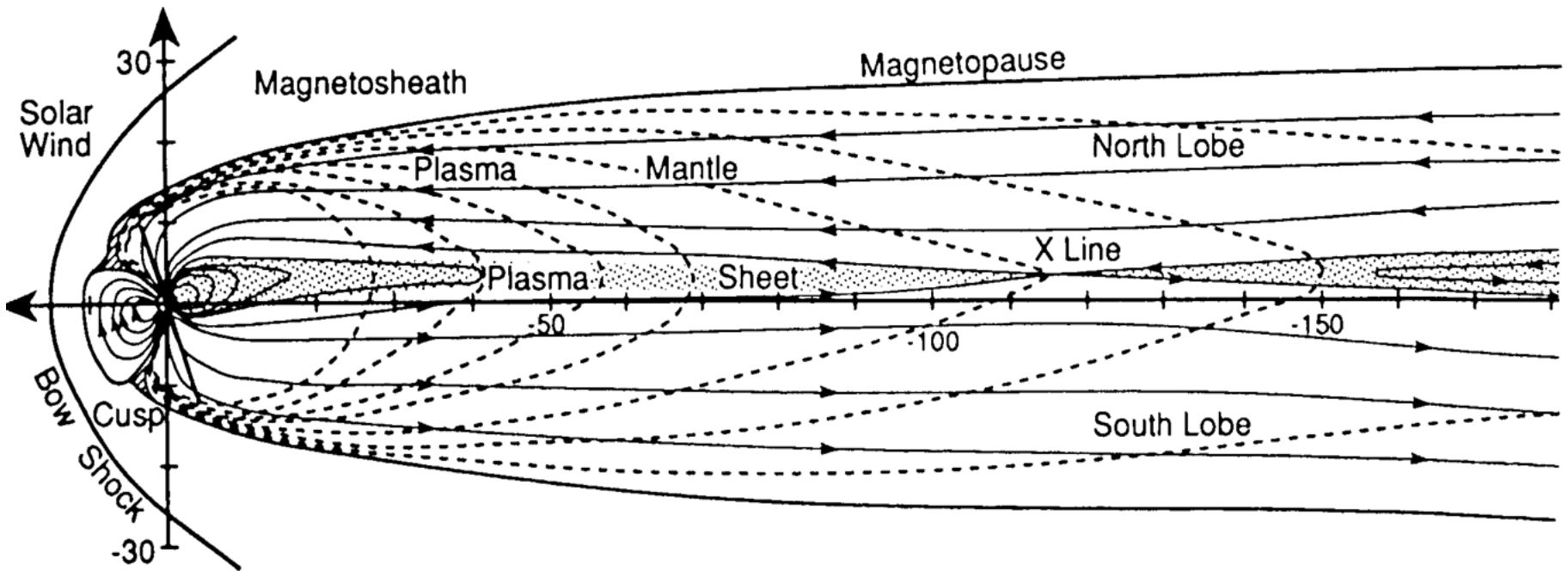


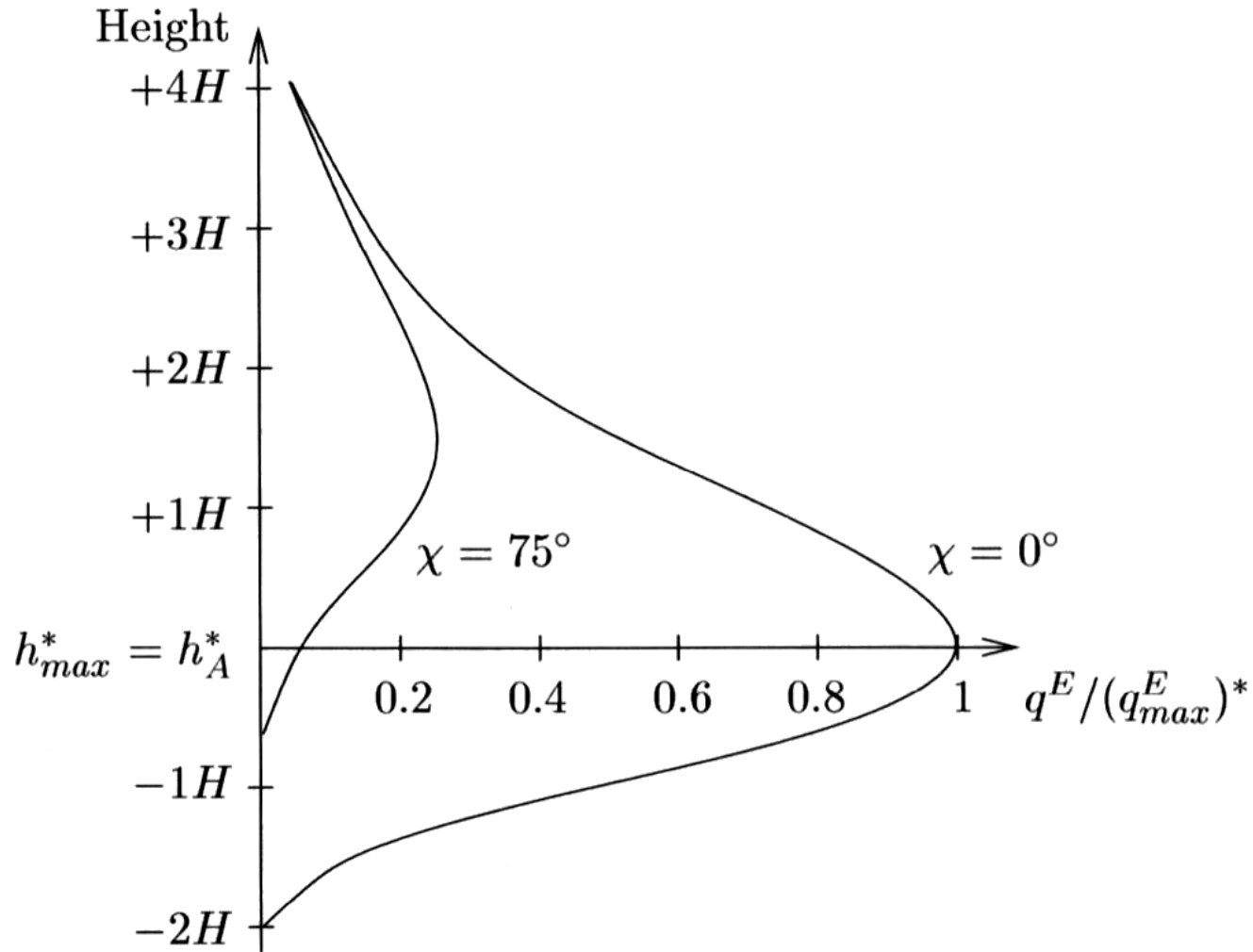
Fig. 1.3. Topography of the solar-terrestrial environment.



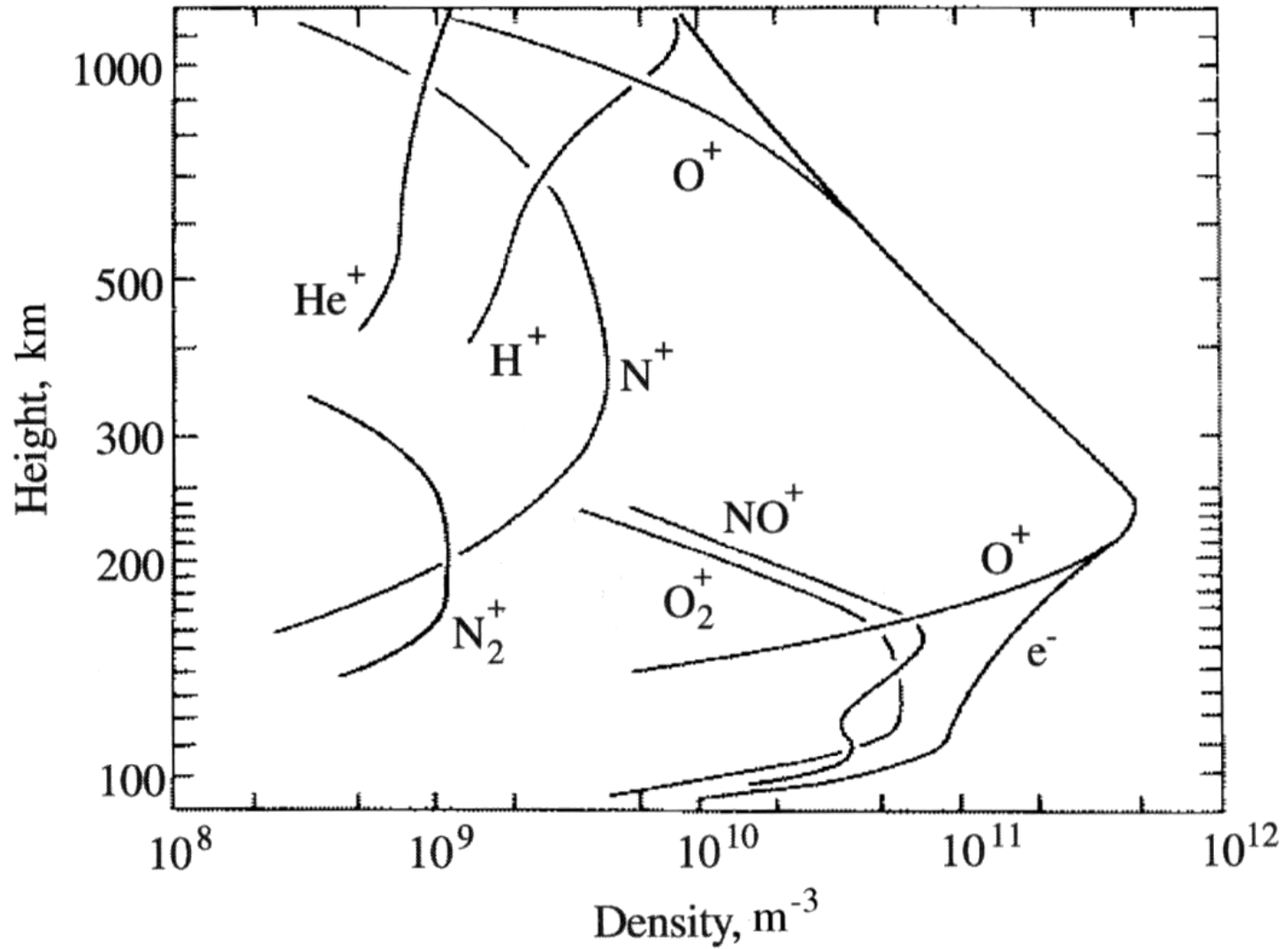
# The magnetotail



# Chapman production function



# Ionospheric densities and composition





# Atmospheric layers

Height, km	Interplanetary Space				
	100 000				
10 000		Hydrogen-sphere (Geocorona)		Exosphere	Plasmapause
			Effusosphere		Plasmasphere (Protonosphere)
1000	Thermosphere	Heterosphere		Exobase	F-Region
			Diffusosphere		E-Region
100	Mesopause	Homopause	Turbopause	Barosphere	D-Region
	Mesosphere				
	Stratopause				
	Stratosphere				
10	Tropopause	Homosphere	Turbosphere		
	Troposphere				
0					
Quantity	Temperature	Composition	Vertical Transport	Gravitational Binding	Thermal Plasma

Fig. 2.13. Classification and nomenclature of the terrestrial atmosphere



# Atmospheric temperature profile

