Hamiltonian approach of gyrokinetics

Aix*Marseille université

Loïc de Guillebon

Centre de Physique théorique, Marseille

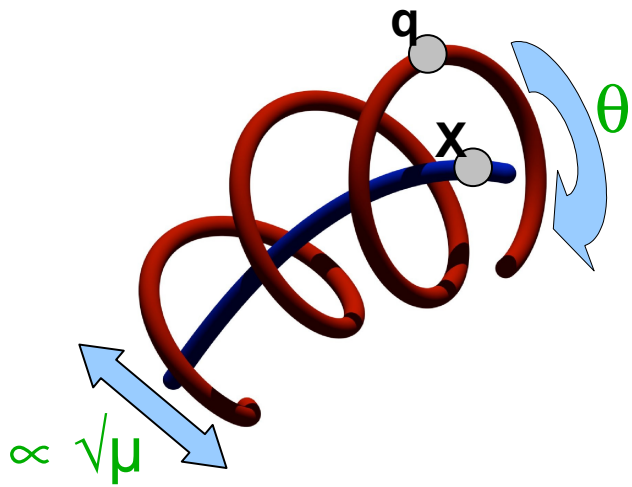
ANR GYPSI

Plasma dynamics: $\frac{\partial}{\partial t} f(\boldsymbol{q}, \boldsymbol{p}) = -\frac{\boldsymbol{p}}{m} \cdot \nabla f - e\left(\boldsymbol{E} + \frac{\boldsymbol{p}}{m} \times \boldsymbol{B}\right) \cdot \frac{\partial}{\partial \boldsymbol{p}} f$ and (**E**,**B**) evolve through Maxwell

⇩ 6 dim. ⇒ **need for a reduction**

Gyrokinetics:

- Vlasov characterictics = particle trajectories
- *Magnetic moment* μ is conserved
- *Fast gyroangle* θ has only averaged effects
- Particle position **q** replaced by guiding-center **X**



$$f(\mathbf{q},\mathbf{p}) = F_{\mu}(\mathbf{q}, p_{\parallel}, \not{\theta})$$

Problems:

→ X and θ not intrinsic !

→ Hamiltonian structure lost ?

⇒

Need for an intrinsic approach