3D Topology of the Magnetic Field in the Solar Corona

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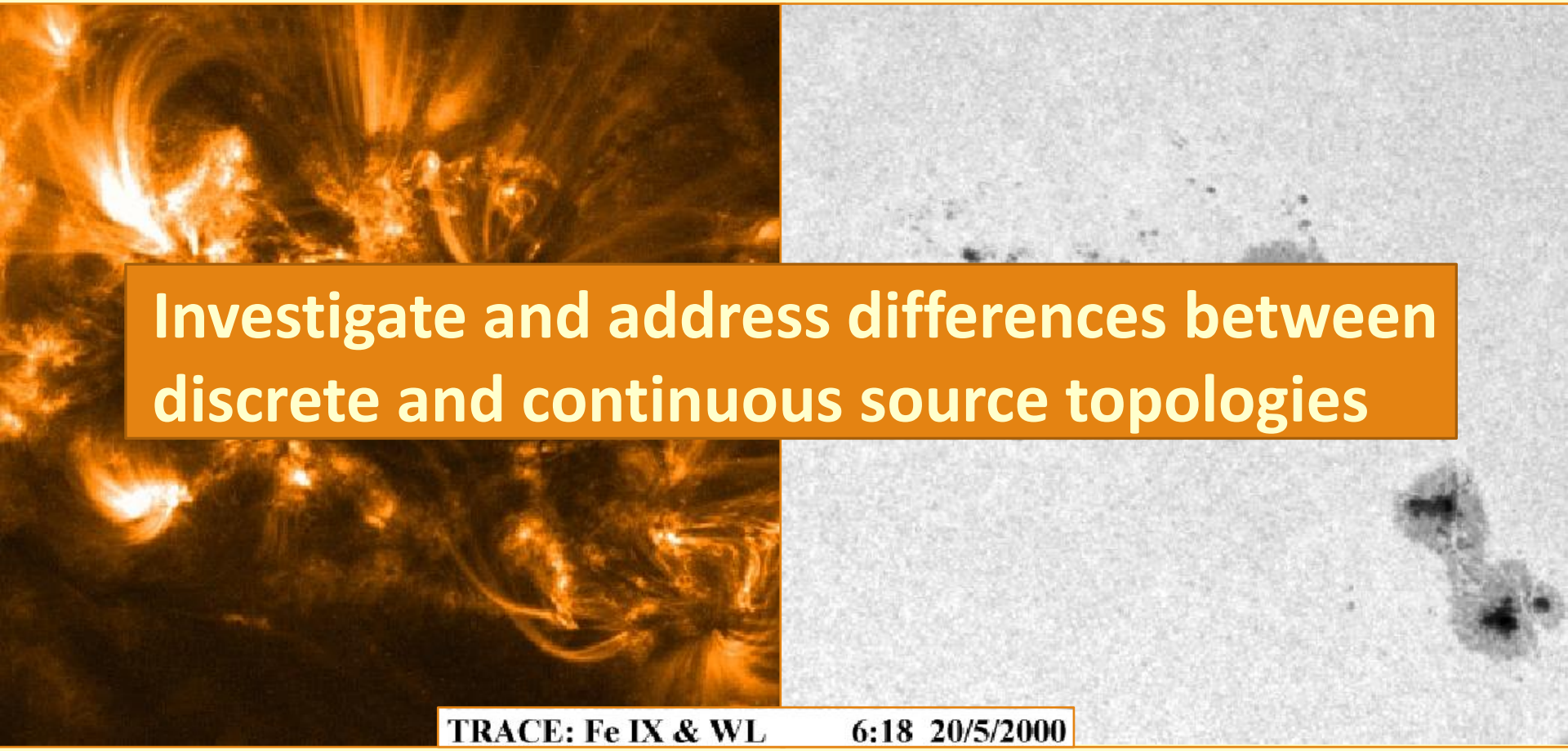
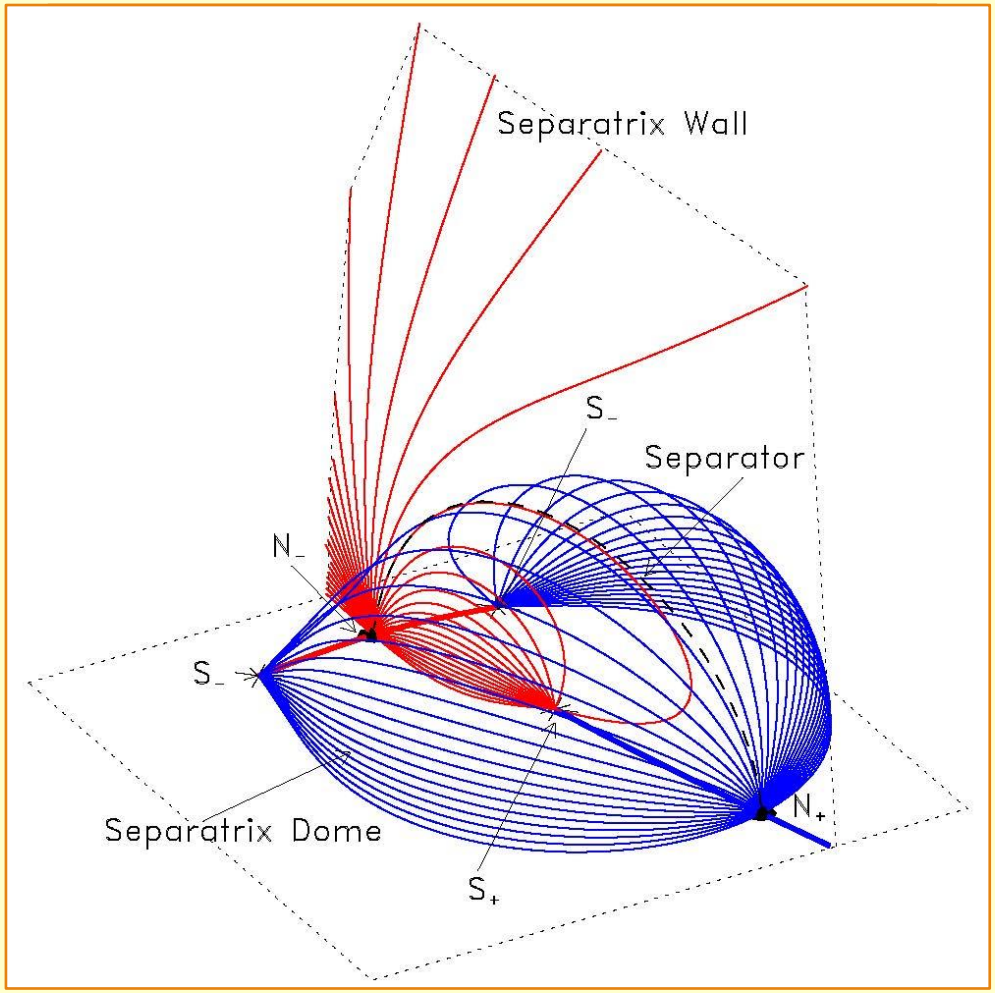


Investigate and address differences between discrete and continuous source topologies

Magnetic Charge Topology

- Simplest, useful model
- Best model for structural simulations
- Assumes j=0, potential
- Treat photosphere as z=0 plane
- Scatter sources of flux on plane

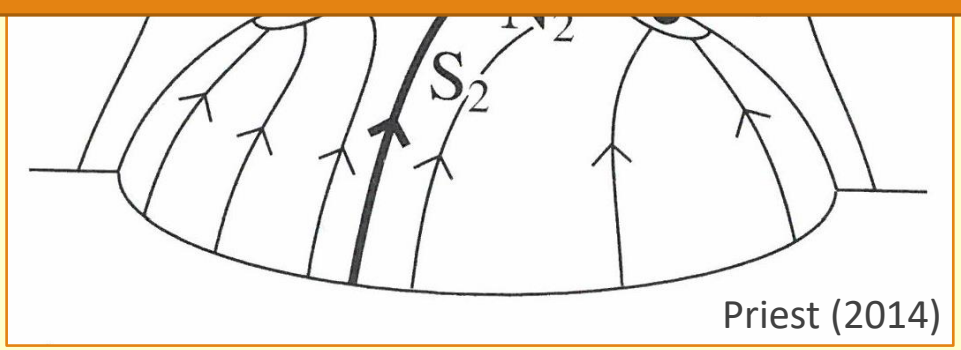
$$\boldsymbol{B}(\boldsymbol{r}) = \sum_i \epsilon_i \frac{\boldsymbol{r} - \boldsymbol{r}_i}{|\boldsymbol{r} - \boldsymbol{r}_i|^3}$$



An Open Separatrix Surface

Aims

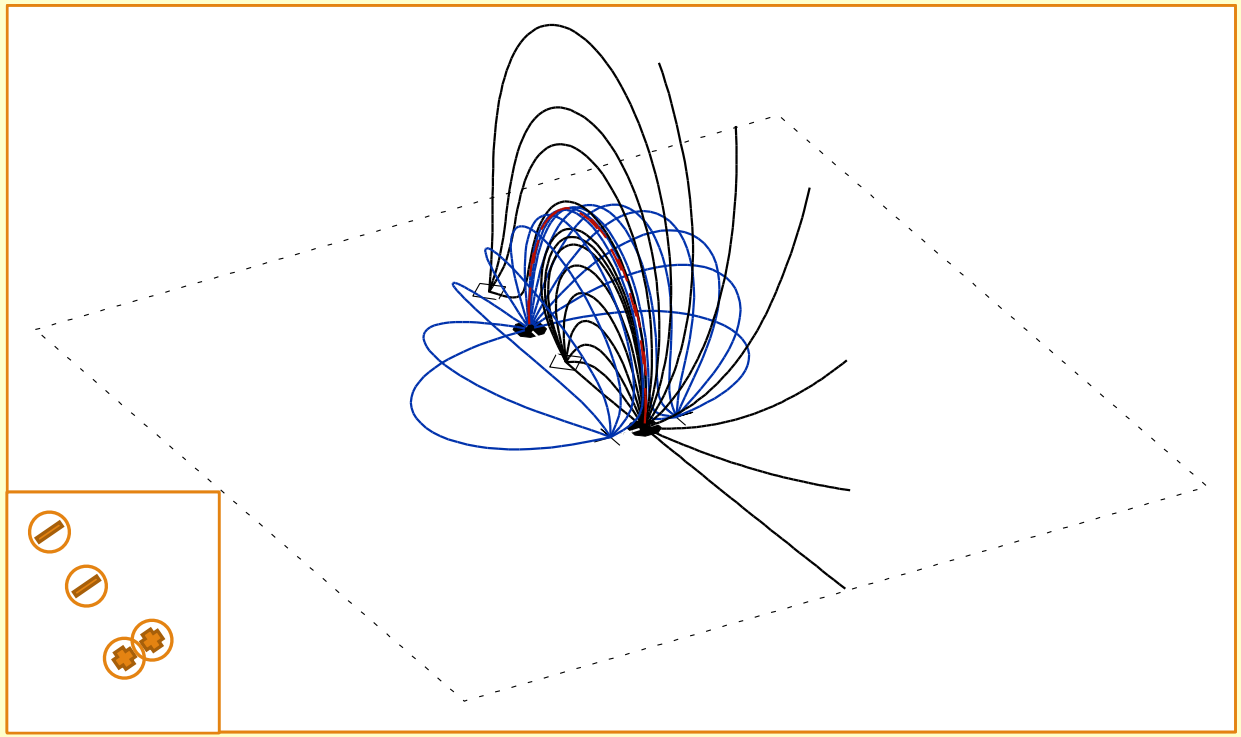
- **Show that topology presented in Priest (2014) may not be complete picture**
- **Define additional features to get more complete picture of topology**



Priest (2014)

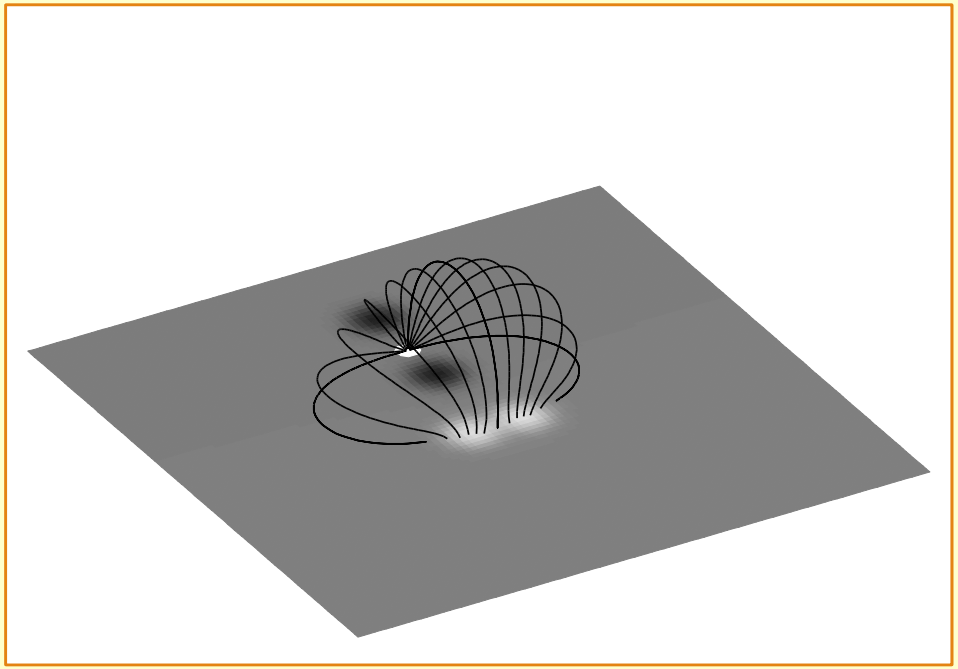
A Discrete Source Study

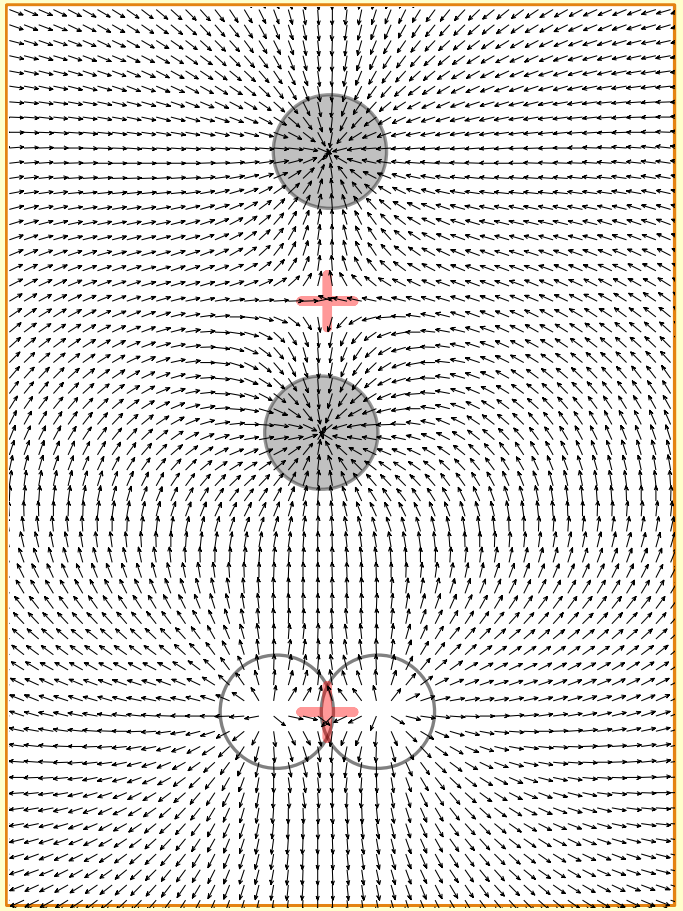
- Produce an intersected state topology with four sources
- Focus on effect moving pairs of sources close together has on topology



A Continuous Source Study

- A continuous source model of same configuration





Null-Like Features

- We can define null-like points
  - Locations where

$$\boldsymbol{B}_x = \boldsymbol{B}_y = 0\,,\, \boldsymbol{B}_z \neq 0$$

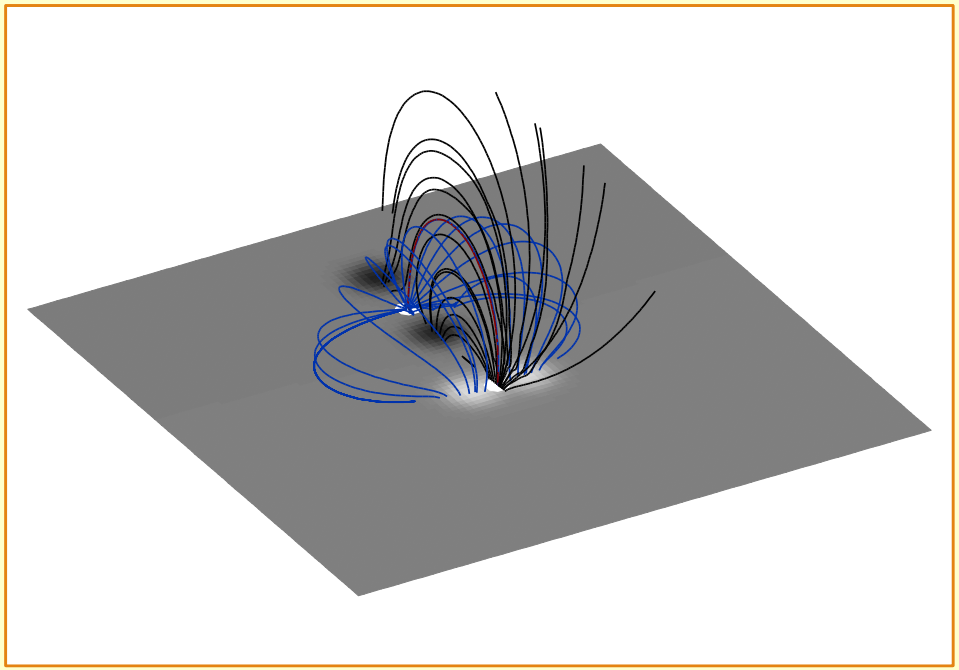
  - Only on z=0 plane
  - Forms an x-line structure

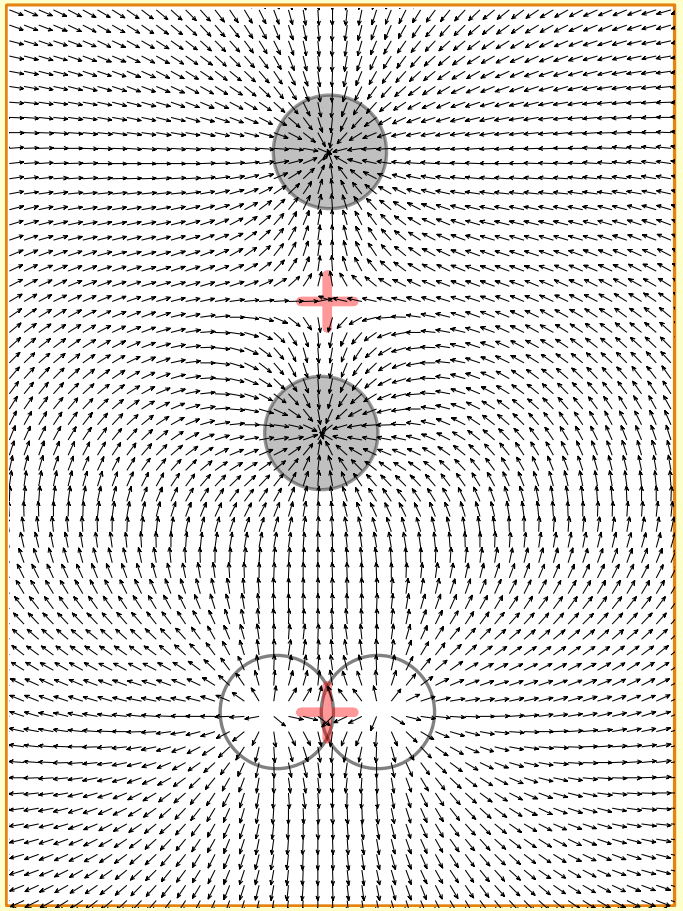
- Separatrix-like surfaces generated from these points

- Intersections in surfaces form separator-like field lines

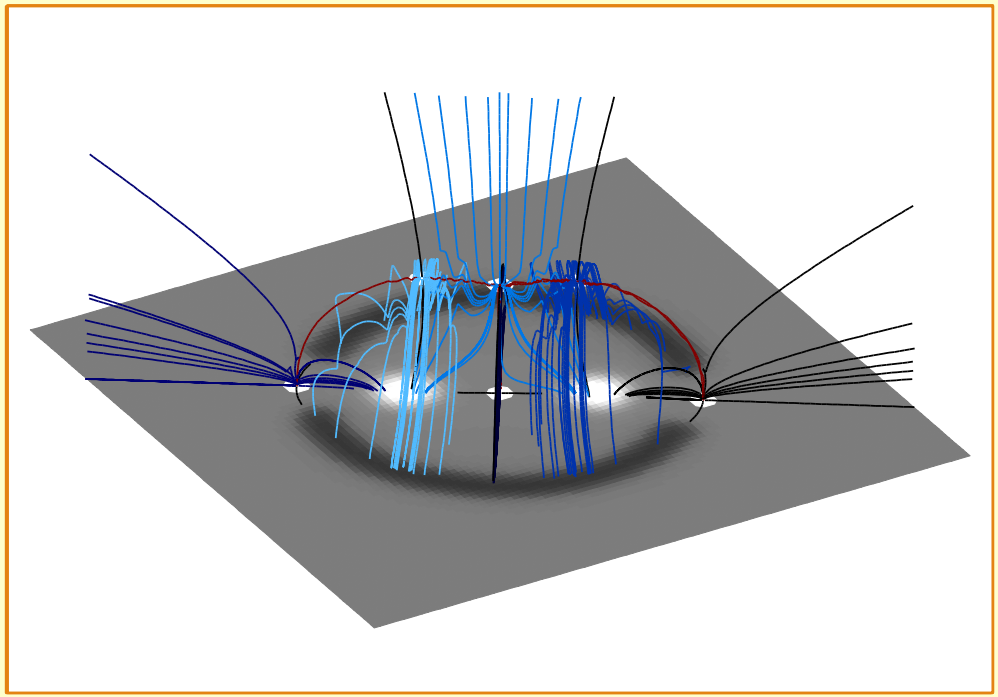
A Complete Continuous Topology

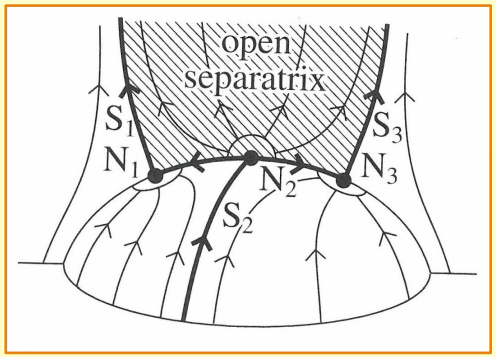
- Null-like point preserves separatrix wall





An Open Separatrix Surface





Priest (2014)

Conclusions

Consideration of null-like points is required for a complete picture of a topology

- For Priest (2014) case, inclusion of null-like points suggests open separatrix may not be as open as previously thought