A GLOSSARY OF MAGNETIC TOPOLOGY

**Boundary null**: Any null having two distinct spine sources. The fan surface of a boundary null is a separatix. A null which is not a boundary null an **internal null**.

**Broken fan**: A fan surface whose field lines connect to two or more distinct fan sources. The fan is therefore broken into **fan sectors** separated by **separators**. A fan which is not broken is an **unbroken fan**.

**Domain**: A volume containing field lines all having the same sources at their ends. Any field line can be continuously deformed into any other field line in the same domain. Denoted $D_r$.

**Chord**:† One of the edges from the chord set of a graph. Each chord in a set corresponds to a unique circuit. In a domain graph, chords along with their corresponding domain circuits are given a roman index $i$ or $j$.

**Chord set**:† A set of edges of a graph whose removal reduce the graph to a tree. For a graph with $N_S$ vertices and $N_d$ edges a chord set will contain $N_d - N_S + 1$ elements: its chords.

**Circuit**:† A closed sequence of edges in a graph. No edge is repeated within a circuit.

**Circuit vector**:† A column vector corresponding to one circuit of a graph. It has one element for each edge of the graph edge. Element $\vec{C}_{si} \neq 0$ if edge $s \in$ circuit $i$.

**Coronal domain**: A domain lying entirely above the photospheric plane of reflectional symmetry, in the $z > 0$ half-space. A coronal domain has no **footprint**.

**Coronal null**: A null point located above the photospheric plane of reflectional symmetry, in the $z > 0$ half-space.

**Domain circuit**: A circuit of edges (domains) in the domain graph. Each domain circuit is given a roman index $i$ or $j$ according to its correpsonding chord.

**Domain graph**: A schematic depiction of a field’s connectivity. Its vertices are **sources** and its edges are **domains**.

**Fan**: see Fan surface.

**Fan sector**: A contiguous portion of a fan surface all of whose field lines end at the same source.
**Fan source:** The source lying at the other end of a fan field line from the null.

**Fan surface:** The surface of field lines connected to a null. Fan field lines originate at a positive null and terminate at a negative null.

**Fan trace:** The curve formed from the intersection of a fan surface with the photospheric plane of reflectional symmetry $z = 0$. Fan traces form the edges of footprints.

**Flux tube:** An open curve connecting a source to infinity. Omitting these curves from the volume permits a single-valued vector potential such that $\nabla \times \mathbf{A} = \mathbf{B}$.

**Footprint:** The two-dimensional regions formed by the intersection of a domain with the photospheric plane of reflectional symmetry $z = 0$. The edges of a footprint are spines and fan traces.

**Incidence matrix:** A matrix $M_{ar}$ corresponding to a graph. It has a row for each edge and a column for each vertex. $M_{ar} \neq 0$ if edge $r$ is incident on vertex $a$.

**Internal null:** A null point for which both spine sources are the same. The fan surface of an internal null is not a separatrix. A null which is not internal is a boundary null.

**Isolating loop:** A closed curve in space which links only one domain circuit exactly once. Each isolating loop consists of separators which compose a circuit in the null graph.

**Null:** A point at which all three components of the magnetic field vanish. A null is either positive or negative depending on the sign of the determinant $\det(-\partial B_i/\partial x_j)$. A positive (negative) null is denoted with a greek index: $B_\beta (A_\alpha)$.

**Null graph:** A schematic depiction of a field’s nulls and separators. Its vertices are nulls, its edges are separators.

**Photospheric null:** A null located within the plane of reflectional symmetry $z = 0$. A null which is not photospheric is a coronal null or the mirror image of one.

**Prone null:** A photospheric null whose spine lies in the photosphere. A photospheric null which is not prone is an upright null.

**Sector:** see Fan sector.

**Separator:** The intersection of separatrix surfaces. A separator field line begins at a positive null and ends at a negative null. Denoted $S_\sigma$. 

Separatrix: A surface lying at the interface of two domains. In a potential field each separatrix is the fan surface of a boundary null.

Skeleton: The ensemble of a field’s nulls, sources, separatrices and separators. Excluded from the skeleton are internal nulls and their fan surfaces and unbroken fans and their nulls.

Source: A volume from which magnetic field lines originate. A source is enclosed by a source skin on which $B_n$ is entirely positive or entirely negative. Denoted by roman suffix $a,b$ or $c$.

Source skin: The closed surface surrounding a source.

Spine: One of the two field lines entering a null point perpendicular to the fan surface. Spine field lines terminate at positive nulls and originate at negative nulls.

Spine source: The source at the end of a spine opposite to the null point. Each null point has two spine sources.

Tree:† A graph consisting of $N_S$ vertices and $N_S - 1$ edges. There is one and only one path of edges connecting any pair of vertices. A tree contains no circuits.

Unbroken fan: A fan surface for which every field line connects to the same fan source. This fan is not broken into sectors and is not part of the field’s skeleton. The null from which the fan originates is connected to no separators and is not part of the skeleton either.

Upright null: A photospheric null whose spine is $\hat{z}$. Symmetry dictates that upright nulls are always internal nulls. A photospheric null which is not upright is a prone null.

† Denotes a term which is standard in the area of graph theory.