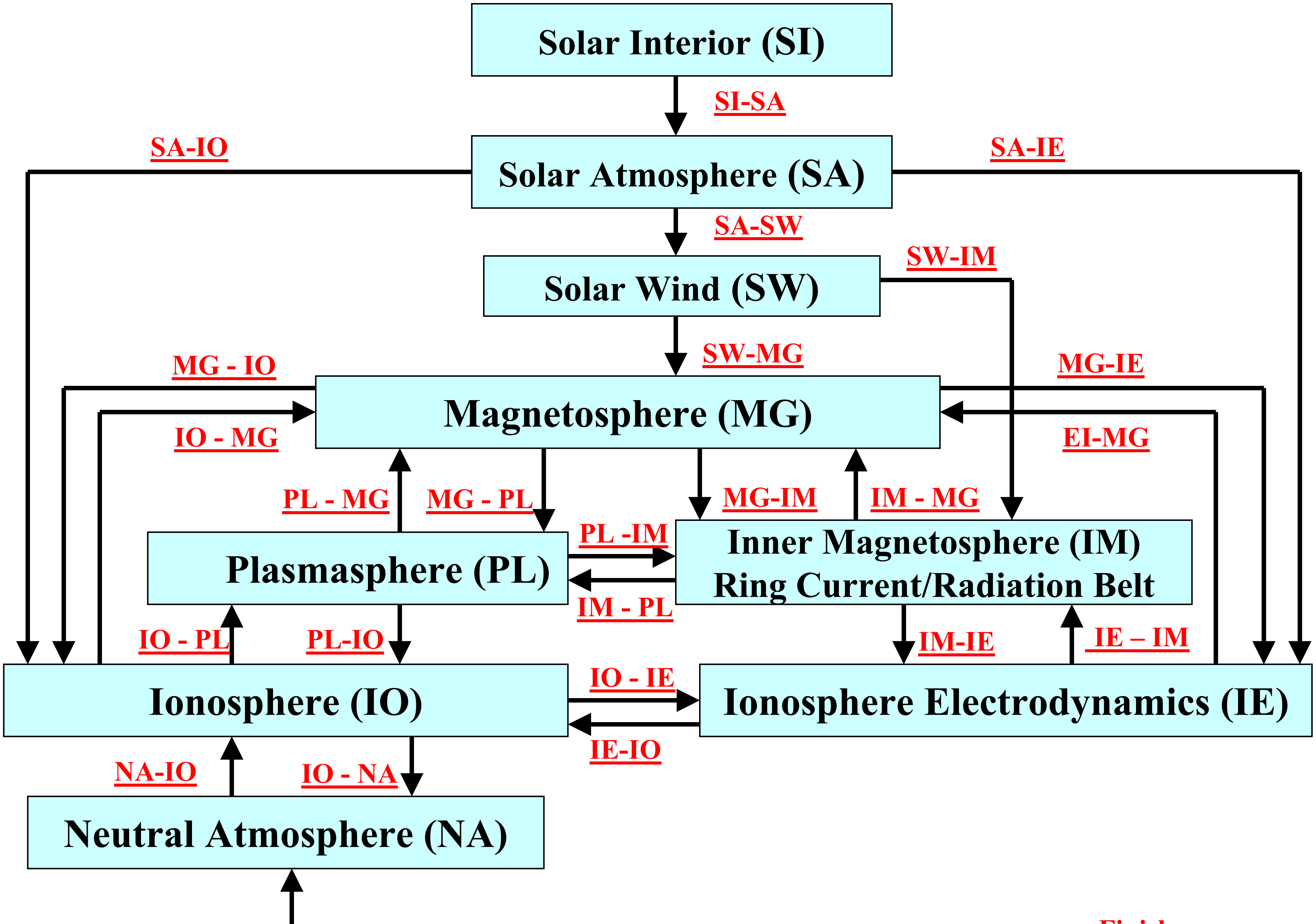
Solar Interior (SI)
SI-SA
SA-IO
SA-IE
Solar Atmosphere (SA)
SA-SW
SW-IM
Solar Wind (SW)
SW-MG
MG - IO
MG-IE
Magnetosphere (MG)
IO - MG
EI-MG
PL - MG
MG - PL
MG-IM
IM - MG
PL -IM
Inner Magnetosphere (IM)
Ring Current/Radiation Belt
Plasmasphere (PL)
IM - PL
IO - PL
PL-IO
IM-IE
IE – IM
IO - IE
Ionosphere (IO)
Ionosphere Electrodynamics (IE)
IE-IO
NA-IO
IO - NA
Neutral Atmosphere (NA)
Finish

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Contributors: S. Ledvina (presenter), D. Odstrci, J. Luhman, G.Fisher, G. Fry, M. Dryer

Solar Interior to Solar Atmosphere (SI – SA)

Physical Parameters: Plasma Density, Temperature/Pressure, Velocity (vector), Magnetic Field (vector)

Time Step Information

Location of the Transition Region:
On the adjoining numerical grids (face centered or cell centered).

Overlapping grids for gradient information and data passing.

Comments: Probably best thing here given state of the art is some observation-based photospheric boundary condition "data base". In particular, radial B fields given for Carrington Rotations.

Back

Contributors: D. Odstrcil(presenter), S. Ledvina, G.Fisher, G. Fry, J. Luhman, M. Dryer

Solar Atmosphere to Solar Wind (SA – SW)

Physical Parameters: Plasma Density, Temperature/Pressure, Velocity (vector), Magnetic Field (vector)

Time Step Information

Location of the Transition Region:
Beyond the outer most critical points (approx. 20-30 solar redii).
On the adjoining numerical grids (face centered or cell centered).
Overlapping grids for gradient information and data passing.

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Contributors: J. Lyon (presenter), J. Luhman, A. Ridley, G. Fry

contributor

Solar Wind to Magnetosphere (SW – MG)

Physical Parameters required by present models:
Density, Pressure, Velocity (vector), Magnetic Field (vector).

Future Possibilities:

Minor species (e.g., He),
Energetic Particles
Wave Spectra – important for SW driving of ULF waves in magnetosphere.

Other Issues: “What and **where**” can be a important as “what”:
Interpolation if 3D data from one grid to another
Need to allow for possibility of 3-D description of solar wind input to magnetospheric models
Different **variable discription** (i.e., cell-centered and face centered)
Extensibility of variables is important for future extensions of models

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Contributors: M-C Fok, A. Ridley

Solar Atmosphere to Ionosphere (SA-IO)

Physical parameters:

- 10.7 cm Flux (for now)
- Spectra of EUV (ideal)
- Average Energy of Precipitating Electrons

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Contributors: M-C Fok, A. Ridley

Solar Atmosphere to Ionosphere Electrodynamic (SA – IE)

Physical parameters:

- 10.7 cm Flux (for now)
- Spectra of EUV (ideal)
- Average Energy of Precipitating Electrons

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Contributors: M-C Fok

Solar Wind to Inner Magnetosphere (SW – IM)

Physical Parameters for Radial Diffusion Model:

- SW Density N
- SW Velocity **V**

Back

Contributors: M-C Fok (presenter)

Magnetosphere to Inner Magnetosphere (MG – IM)

Physical Parameters:

- 3D Magnetic Magnetic Field
- Inner Plasma Sheet Density
- Inner Plasma Sheet Temperature
- Field line volume (for RCM)

What Drives Ring Current and Radiation Belt Models:

- Magnetic filed model (MG – IM)
- Convection electric field model (IE – IM)
- Particle distribution at model boundary (MG – IM)
- Radial diffusion model (SW – IM)
- Models of wave-particle interaction (PL – IM)

Contributors: M-C Fok (presenter)

Inner Magnetosphere to Magnetosphere (IM – MG)

Physical Parameters:

- Pressure in Inner Magnetosphere
- Subauroral Electric Potential, Ionospheric Potential at MHD Equatorward Boundary

Plasmasphere to Magnetosphere
(PL – MG)

Contributors: M-C Fok, A. Ridley

Magnetosphere to Plasmasphere (MG - PL)

Physical Parameters:

- Estimated auroral particle precipitation

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Contributors: A. Ridley (presenter)

Magnetosphere to Ionosphere Electrodynamic (MG – IE)

Physical Parameters:

- Field-Aligned Currents
- Estimated auroral particle precipitation

Back

Contributors: A. Ridley (presenter)

Ionosphere Electrodynamic to Magnetosphere (IE – MG)

Physical Parameters:

- Convection Electric Field

Back

Contributors: A. Ridley (presenter),

Ionosphere to Magnetosphere (IO – MG)

Physical Parameters:

- Perpendicular velocity, outgoing density, temperature, and field-aligned velocity of different species

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Contributors: A. Ridley (presenter),

Magnetosphere to Ionosphere (MG – IO)

Physical Parameters:

- Field aligned currents
- Precipitating electron total and average energy flux

More Complex:

- Precipitating electron distribution function and ion distribution function with some indication of pitch angles
- Interhemispheric transport on closed field lines through the magnetosphere (see PL – IO)

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Ionosphere Electrodynamic to Ionosphere (IE – IO)

Physical Parameters:

- Convection Electric Field

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Ionosphere to Ionosphere Electrodynamics (IO – IE)

Physical Parameters:

- Height integrated diffusion of neutral wind
(change in field aligned current due to neutral wind)
- Height integrated conductances

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Contributors: M-C Fok

Ionosphere Electrodynamic to Inner Magnetosphere (IE – IM)

Physical Parameters:

- Ionospheric potential distribution
- Height integrated conductances (for Fok's CRCM model)

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Contributors: M-C Fok

Inner Magnetosphere to Ionosphere Electrodynamic (IM – IE)

Physical Parameters:

- Field-Aligned Current,
- Ions and Electrons Precipitation in Sub-Auroral Region (<70 deg lat)

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Contributors: A. Ridley

Plasmasphere to Ionosphere (PL – IO)

Physical Parameters:

- Downward flux of ions on the nightside
- Interhemispheric transport on closed field lines through the magnetosphere

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Ionosphere to Plasmasphere (IO – PL)

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Contributors: M-C Fok (presenter), A. Ridley

Plasmasphere to Inner Magnetosphere (PL – IM)

Physical Parameters and Models:

- Models of wave-particle interaction
- Geocorona of different species to calculate loss rate of ions and electrons

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Inner Magnetosphere to Plasmasphere
(IM - PL)

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Contributors: J. Huba (presenter), A. Ridley

Neutral Atmosphere to Ionosphere (NA – IO)

Neutral parameters in spherical, geophysical coordinates (latitude, longtitude, altitude) every 15 minutes (or so):

- Neutral density: H, He, N, O, N_2 , NO, O_2
- Neutral temperature: T_n
- Neutral wind: V_n

Electric field

- Empirical model (e.g., Fejer/Scherliess)
- Self-consistent (need the neutral wind V_n for low- to mid-latitude ionosphere)

Plasma dynamics:

- Magnetic coordinate system, decoupled parallel and perpendicular plasma dynamics
- Tilted dipole; Offset tilted dipole, IGRF

Ionosphere models keep track on both coordinate systems

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Contributors: J. Huba (presenter), A. Ridley

Ionosphere to Neutral Atmosphere (NA - IO)

Physical Parameters:

- Different species densities, velocities, and temperatures
- Precipitating electron and ion distribution functions to calculate ionization rates and heating rates

Comments: Ionosphere and Neutral Atmosphere are not easily decoupled.
Almost every parameter for different models at each grid cell.
Photoionization requires that you know the local density for all of the atom/molecules which are going to be photoionized and Chapman integral for all neutral constituents.