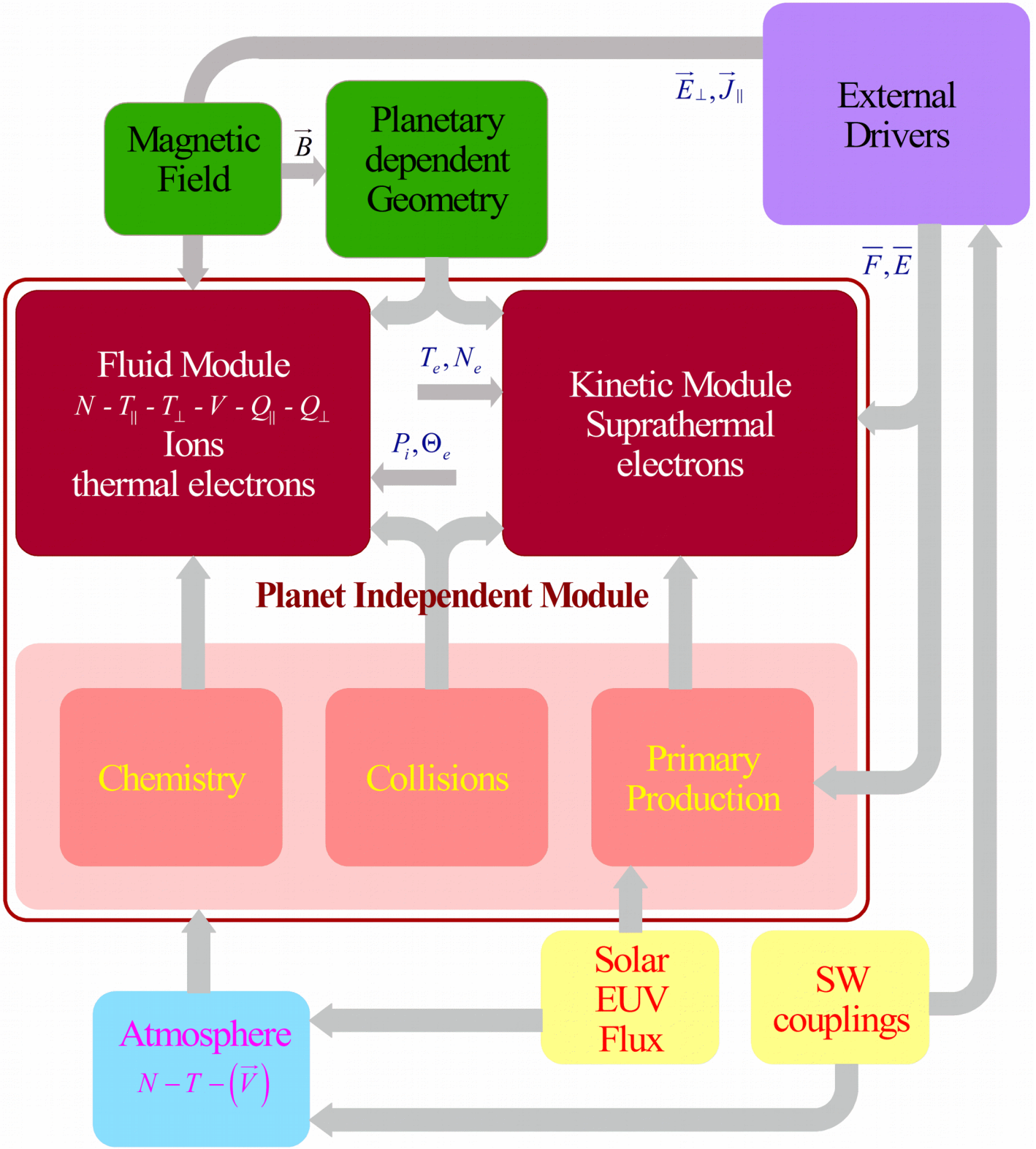
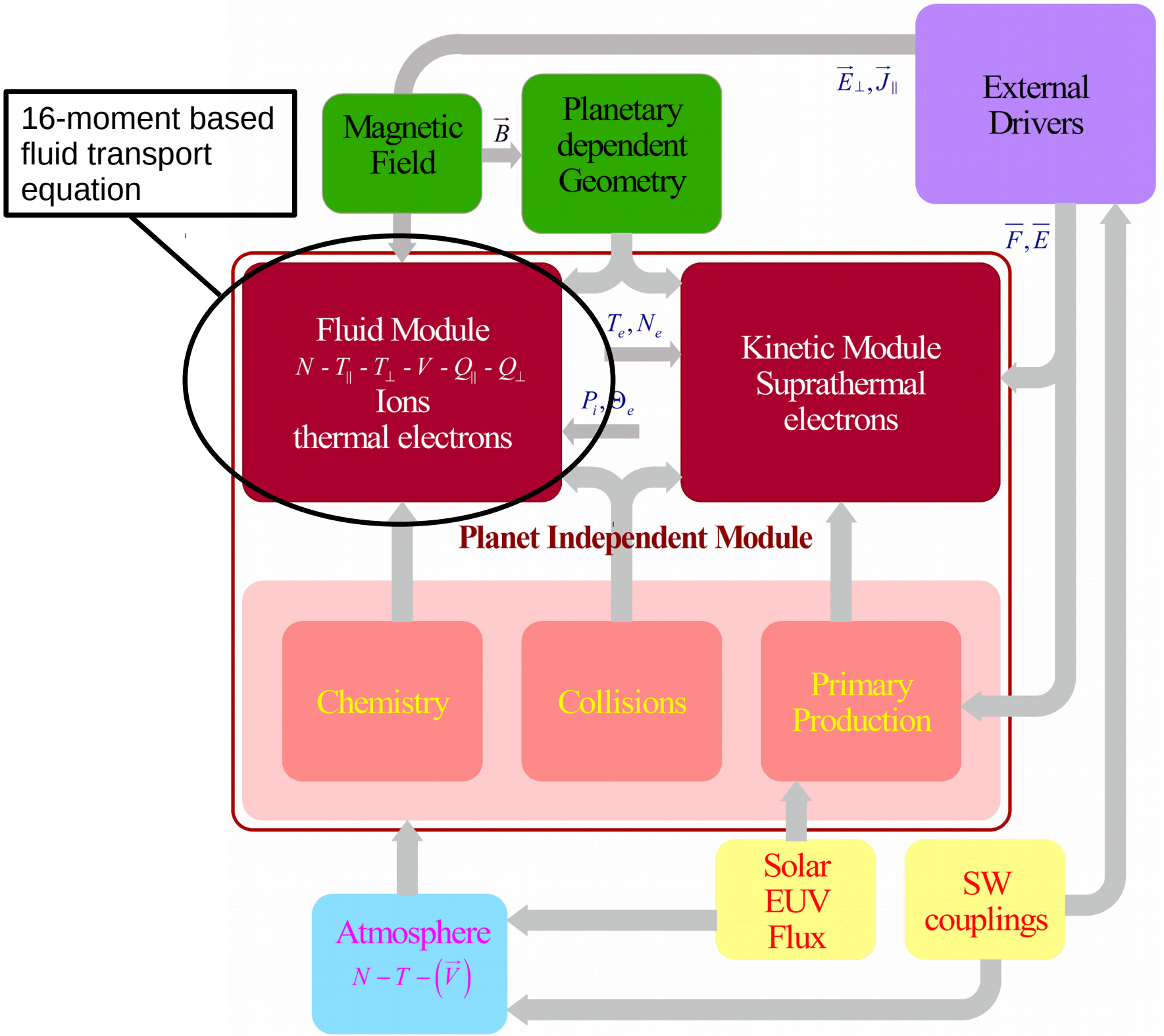
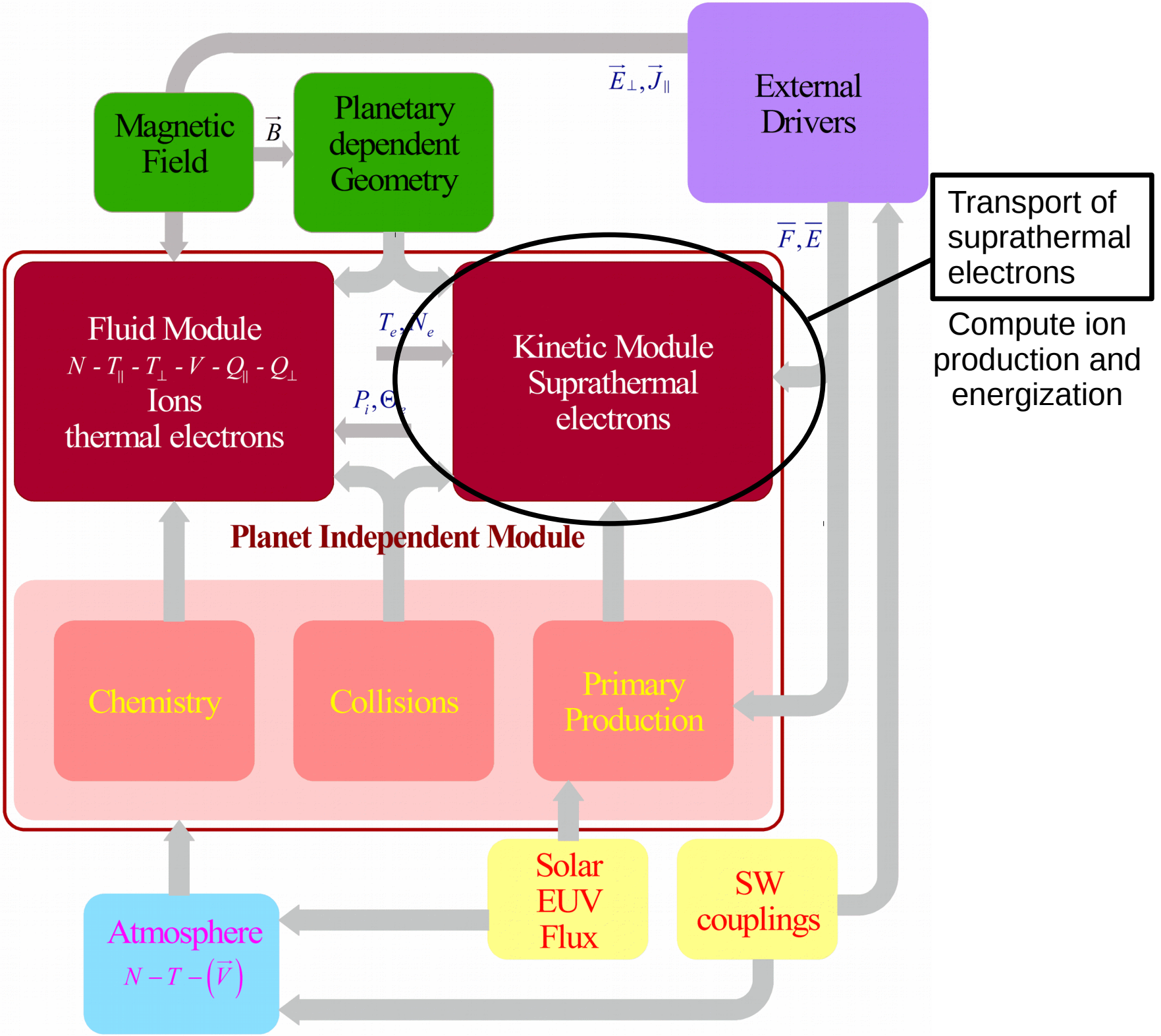
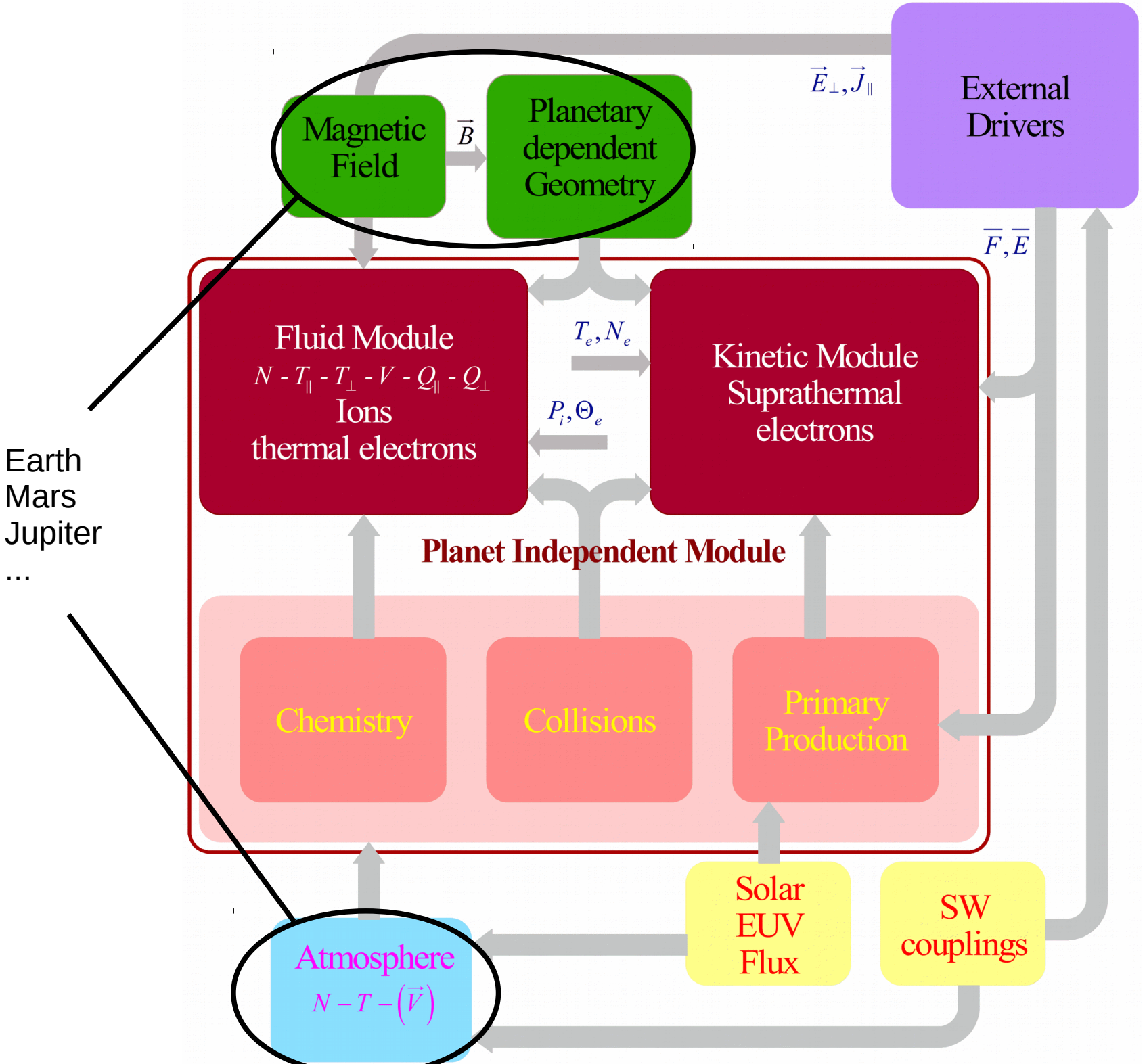
IPIM

- IRAP Plasmasphere-Ionosphere Model
- Multispecies ionospheric plasma transport along magnetic field lines
- Planet independent code : Earth, Mars, Jupiter and work in progress Venus and Saturn.
- Marchaudon, A., and P.-L. Blelly, A new 16-moment interhemispheric model of the ionosphere : IPIM, J. Geophys. Res., 120,2015.


External Drivers
$\vec{E}_\perp, \vec{J}_\parallel$
Magnetic Field
$\vec{B}$
Planetary dependent Geometry
$\overline{F}, \overline{E}$
Fluid Module
$N - T_\parallel - T_\perp - V - Q_\parallel - Q_\perp$
Ions
thermal electrons
T_e, N_e
P_i, Θ_e
Kinetic Module
Suprathermal
electrons
Planet Independent Module
Chemistry
Collisions
Primary Production
Solar EUV Flux
SW couplings
Atmosphere
$N - T - (\vec{V})$


16-moment based fluid transport equation
Magnetic Field
$\vec{B}$
Planetary dependent Geometry
$\vec{E}_\perp, \vec{J}_\parallel$
External Drivers
$\overline{F}, \overline{E}$
Fluid Module
$N - T_\parallel - T_\perp - V - Q_\parallel - Q_\perp$
Ions
thermal electrons
T_e, N_e
P_i, Θ_e
Kinetic Module
Suprathermal electrons
Planet Independent Module
Chemistry
Collisions
Primary Production
Solar EUV Flux
SW couplings
Atmosphere
$N - T - (\vec{V})$


External Drivers
$\vec{E}_\perp, \vec{J}_\parallel$
Magnetic Field
$\vec{B}$
Planetary dependent Geometry
$\overline{F}, \overline{E}$
Transport of suprathermal electrons
Compute ion production and energization
Fluid Module
$N - T_\parallel - T_\perp - V - Q_\parallel - Q_\perp$
Ions
thermal electrons
T_e, N_e
P_i, Θ_e
Kinetic Module
Suprathermal
electrons
Planet Independent Module
Chemistry
Collisions
Primary Production
Solar EUV Flux
SW couplings
Atmosphere
$N - T - (\vec{V})$


External Drivers
$\vec{E}_\perp, \vec{J}_\parallel$
Magnetic Field
$\vec{B}$
Planetary dependent Geometry
$\overline{F}, \overline{E}$
Fluid Module
$N - T_\parallel - T_\perp - V - Q_\parallel - Q_\perp$
Ions
thermal electrons
T_e, N_e
P_i, Θ_e
Kinetic Module
Suprathermal
electrons
Planet Independent Module
Chemistry
Collisions
Primary Production
Solar EUV Flux
SW couplings
Atmosphere
$N - T - (\vec{V})$
Earth
Mars
Jupiter
...

Run on request : TRANSWEB

REQUEST A NEW RUN

Earth

Mars

Jupiter

USER

Email (where we'll send the run results)

your@email.net

Description (optional, but recommended)

A concise description of this run

SPECIES

- [x] H
- [x] N
- [x] H^+
- [x] N^+
- [x] O
- [x] N_2
- [x] O^+
- [x] N_2^+
- [x] O_2
- [x] NO^+
- [x] O_2^+

TIMESPAN

Simulation start date (YYYY-MM-DD)

20/03/2015

Simulation start time (HH:MM:SS)

15:00:00

Simulation duration (HH:MM:SS)

01:00:00

Output time interval (s)

60

KINETICS

- [x] Compute Photoionization
- [ ] Compute electron precipitation

MAGNETIC FIELD

Magnetic field model

IGRF

NEUTRAL ATMOSPHERE

Atmospheric profile

MSIS

LOCATION #1

Coordinates frame

Geographic (lon, lat)

Longitude

180

Latitude

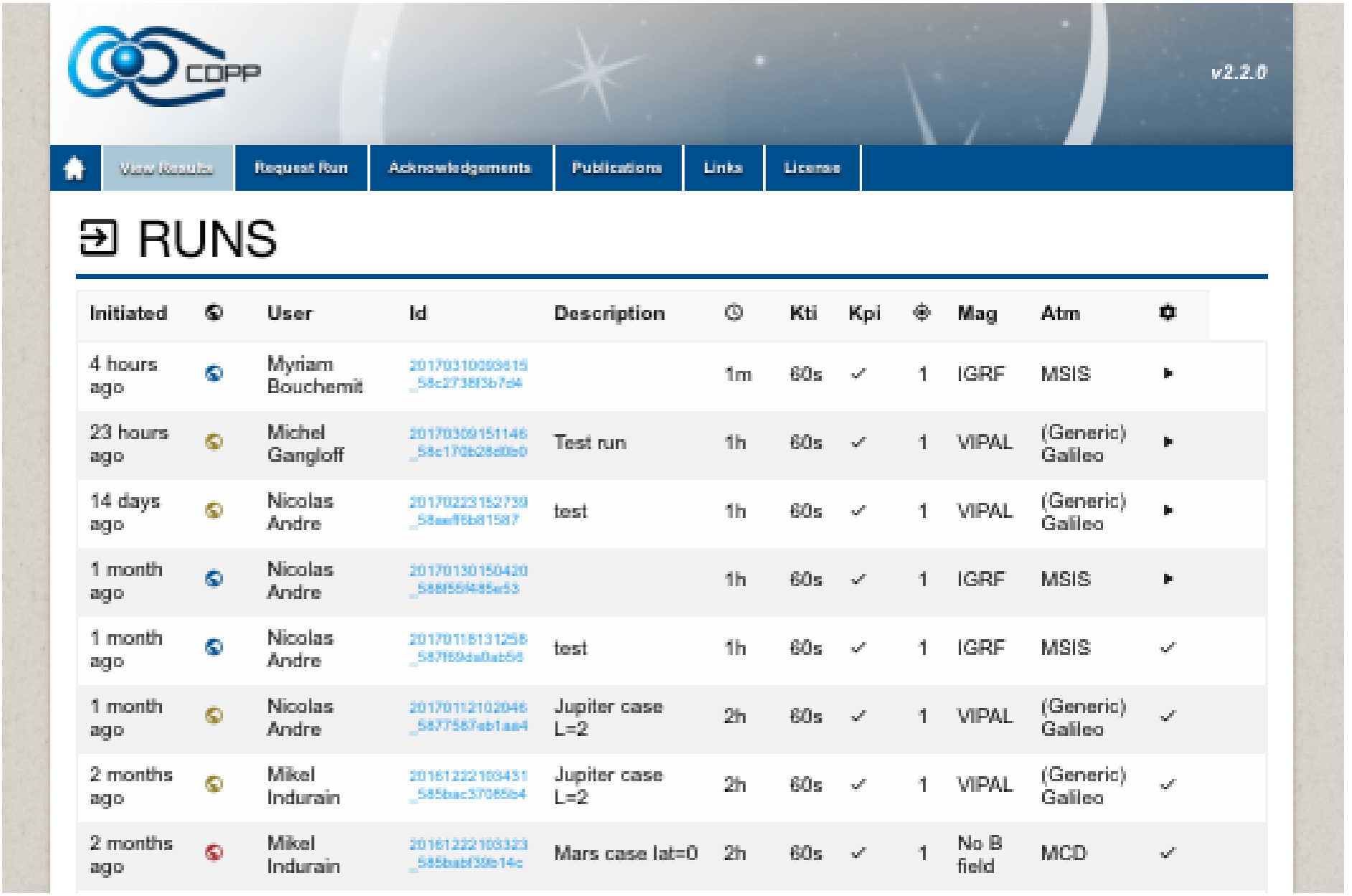
45

LOCATION #2

- [x] DISABLED

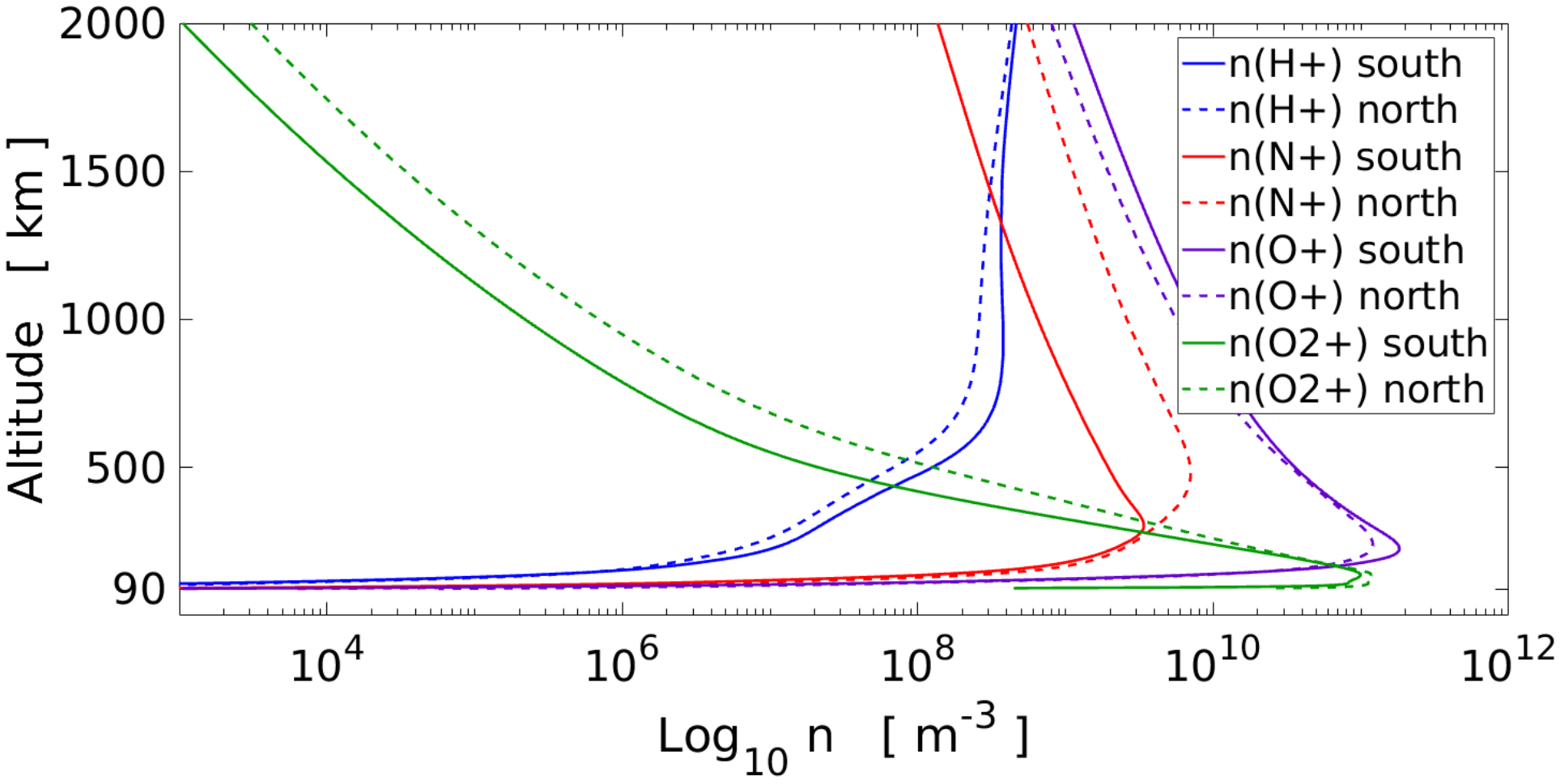
Request Run

Récupérer les résultats

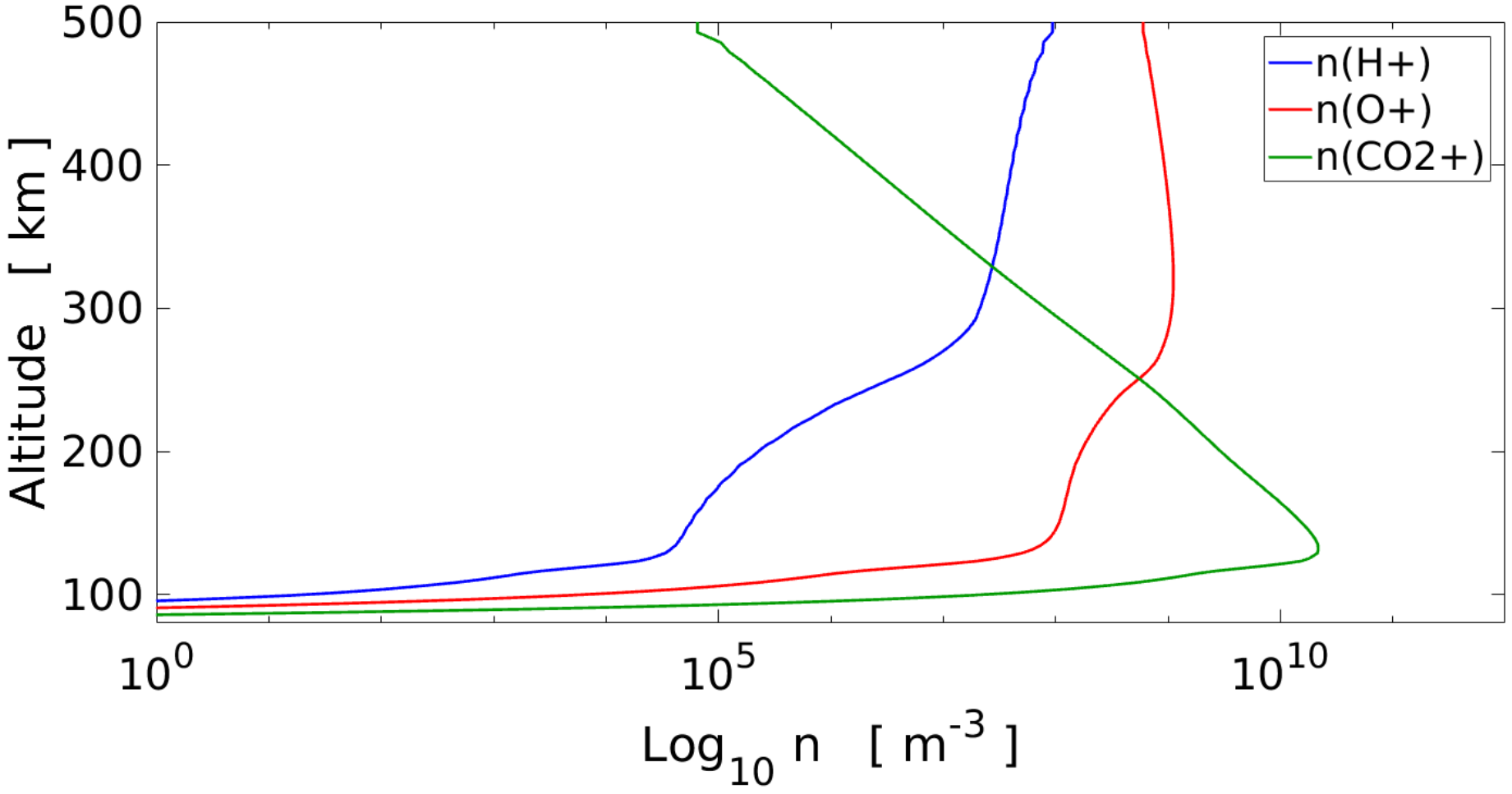



v2.2.0
View Results
Request Run
Acknowledgements
Publications
Links
License
Download Zip File
Run 20161222103323_585babf39b14c
Mars case lat=0
Download output
Make another run like this
General run configuration
Planet
Mars
Start Date and Time
2015-03-20 15:00:00
Duration
7200s by steps of 0.5s
Species
H^+, N_2^+, NO^+, O^+, O_2^+, CO_2^+
Simulation configuration
Kinetics
Every 60s, with photoionization
Magnetic model
No B field
Atmospheric profile
MCD
Locations
GEO
180 / 0
Download CDF
Send to externa
tool via standar
protocol (SAMP

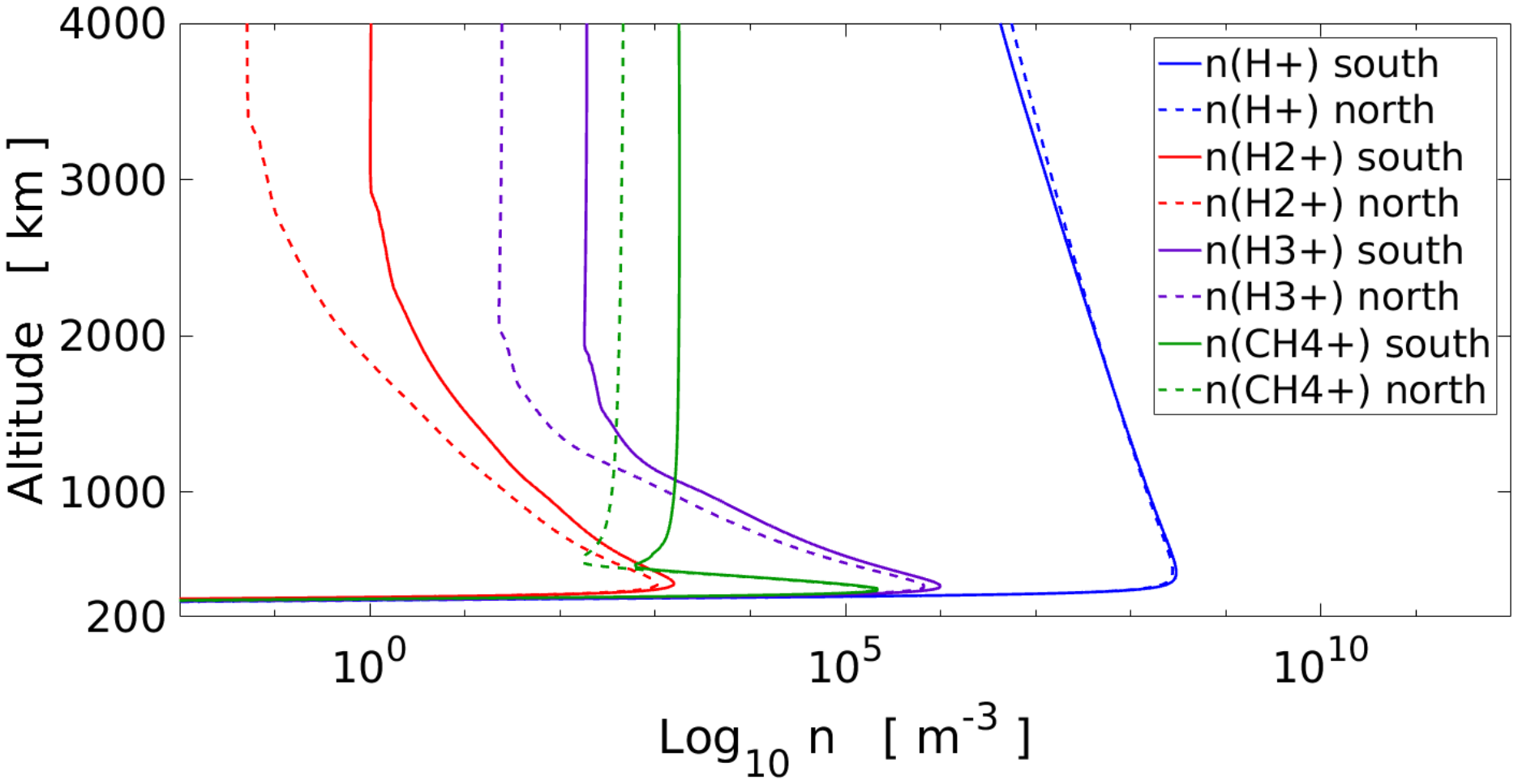
EARTH


2000
1500
1000
500
90
Altitude [km]
10^4
10^6
10^8
10^{10}
10^{12}
Log_{10} n [m^{-3}]
n(H+) south
n(H+) north
n(N+) south
n(N+) north
n(O+) south
n(O+) north
n(O2+) south
n(O2+) north

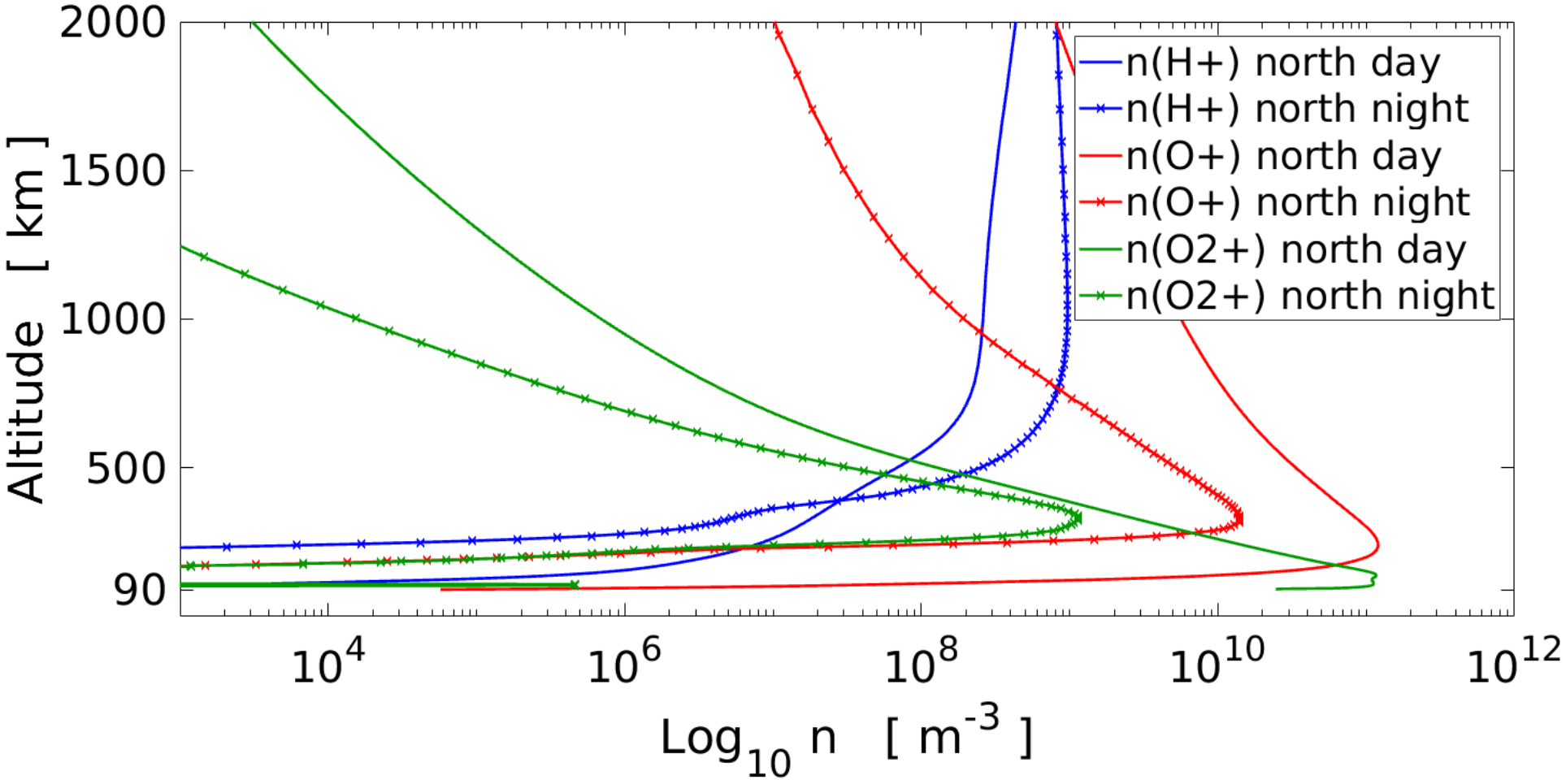
MARS


500
400
300
200
100
Altitude [km]
10^0
10^5
10^{10}
Log_{10} n [m^{-3}]
n(H+)
n(O+)
n(CO2+)

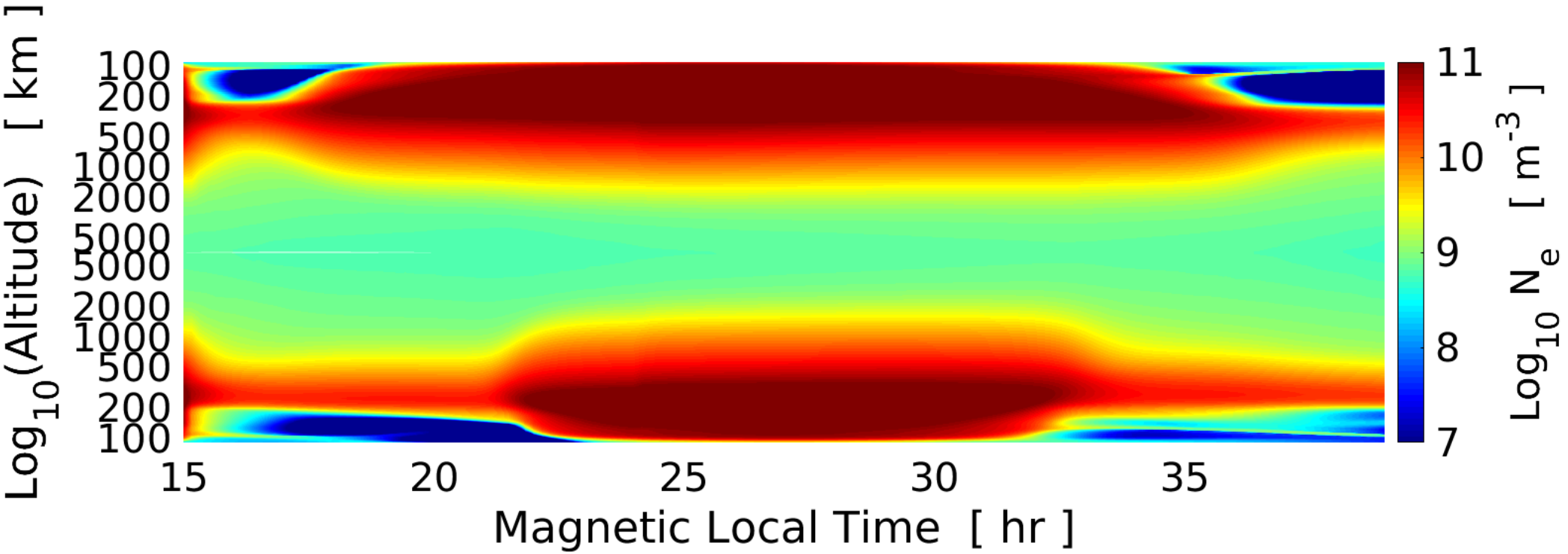
JUPITER


4000
3000
2000
1000
200
Altitude [km]
10^0
10^5
10^{10}
Log_{10} n [m^{-3}]
n(H+) south
n(H+) north
n(H2+) south
n(H2+) north
n(H3+) south
n(H3+) north
n(CH4+) south
n(CH4+) north

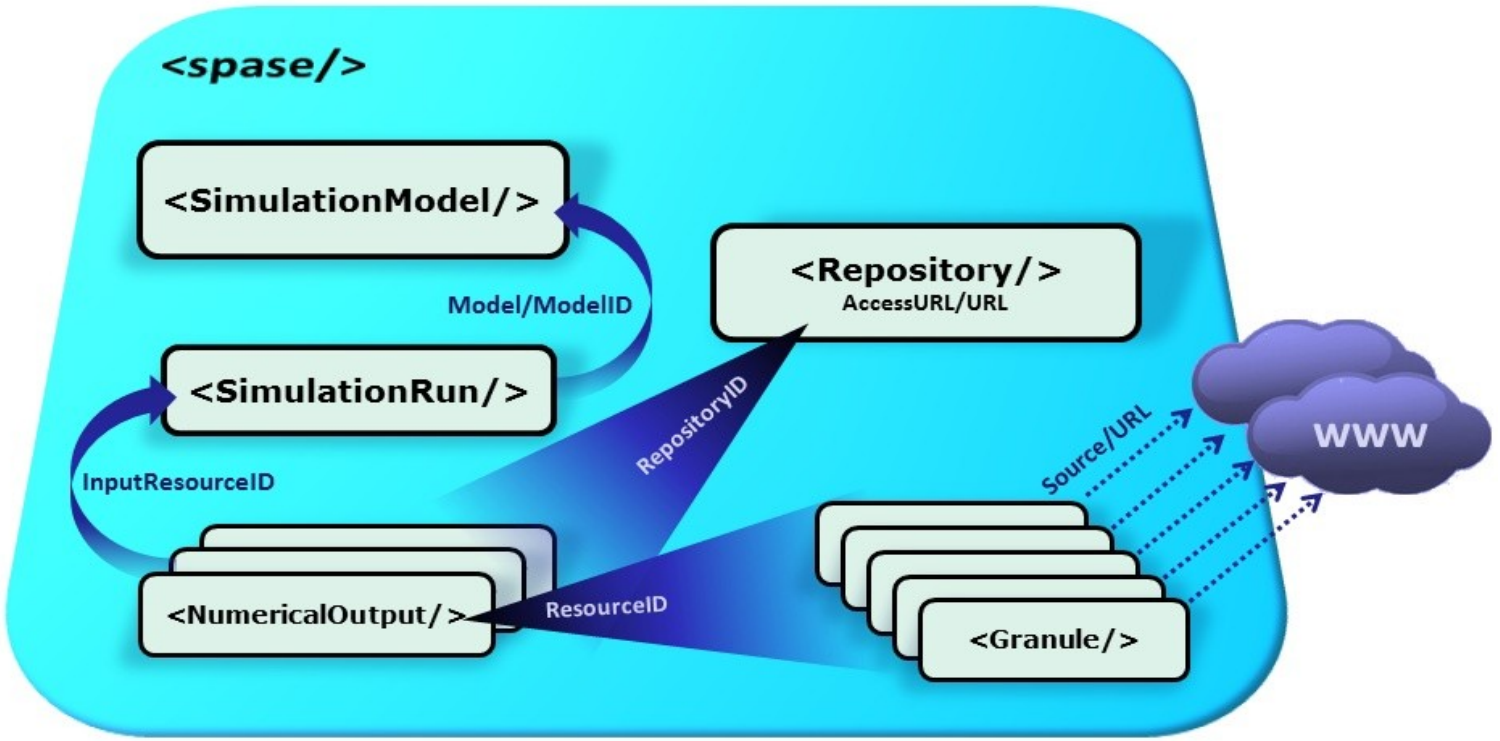
EARTH : diurnal variations



EARTH :
diurnal variations



DATA MODEL :
Impex applied to IPIM simulation data

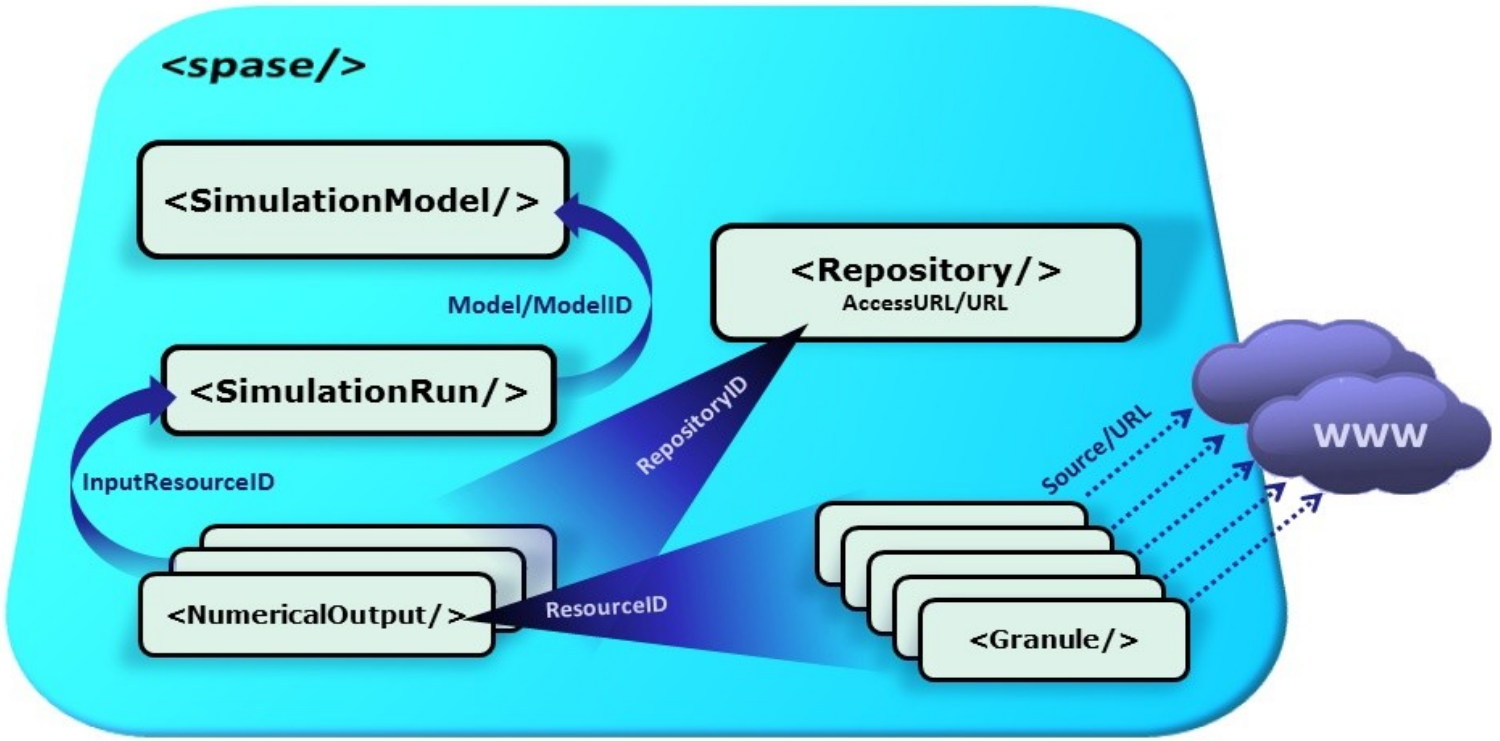


Simulation Model

- IPIM-Earth
- IPIM-Mars
- IPIM-Jupiter

ResourceID

- spase://IMPEX/SimulationModel/IRAP/IPIM_EARTH
- spase://IMPEX/SimulationModel/IRAP/IPIM_MARS
- spase://IMPEX/SimulationModel/IRAP/IPIM_JUPITER

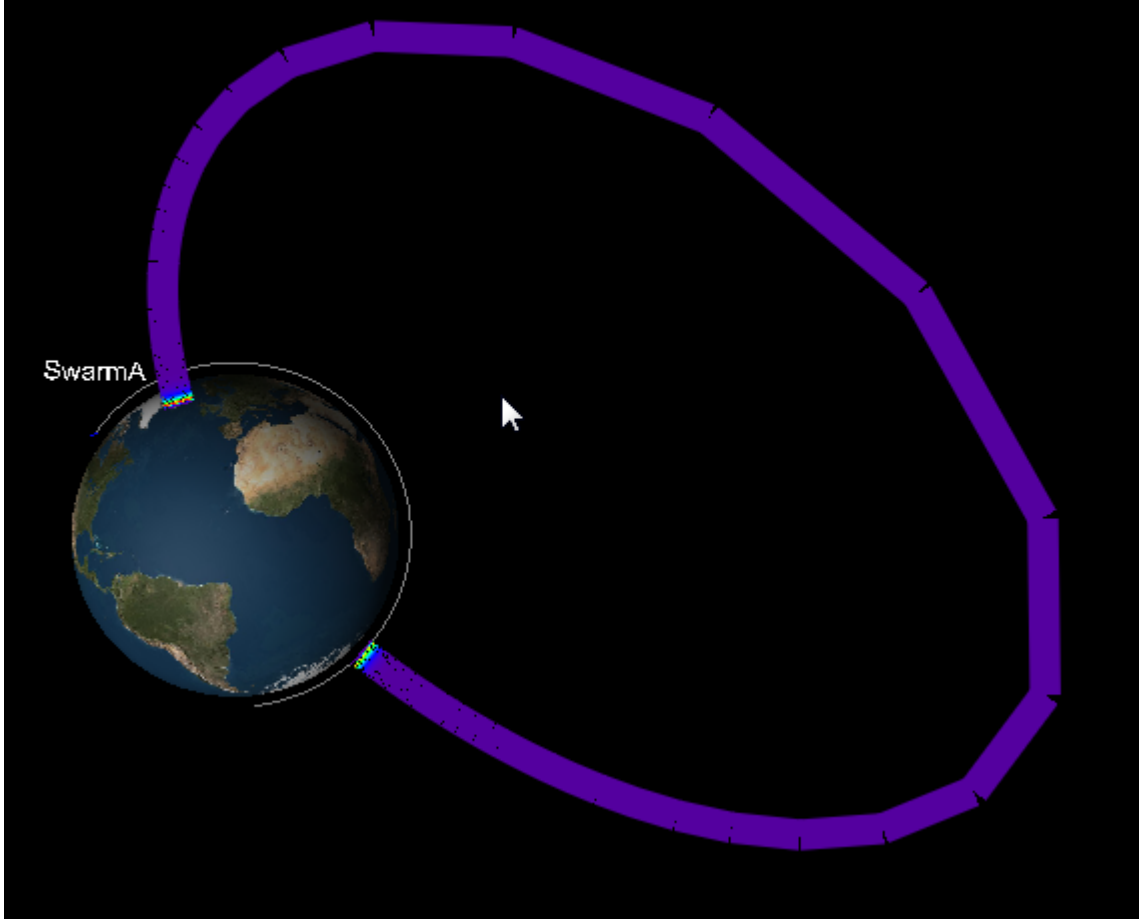


Repository

Only one

ResourceID
spase://IMPEX/Repository/IRAP/IPIM

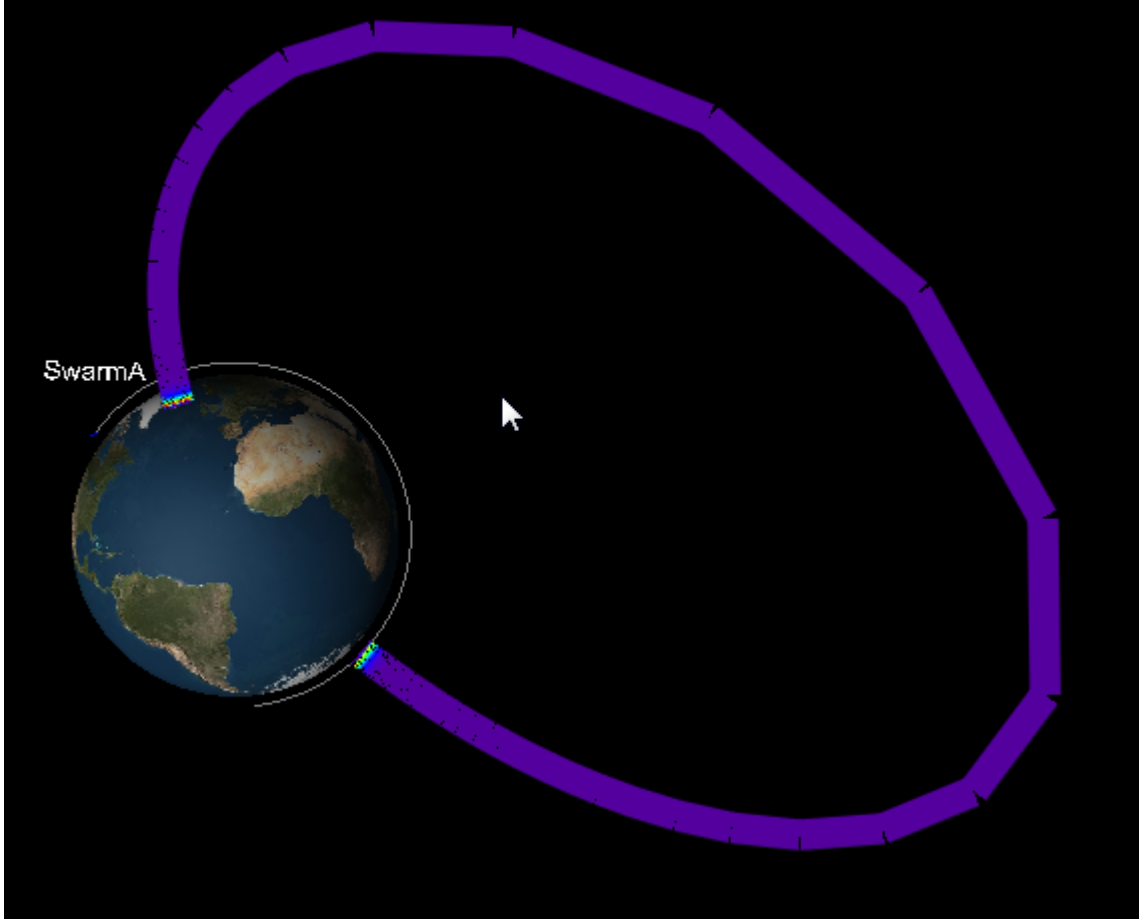
URL
http://transplanet.irap.omp.eu



Simulation Run

- **ModelID**
- **RepositoryID**

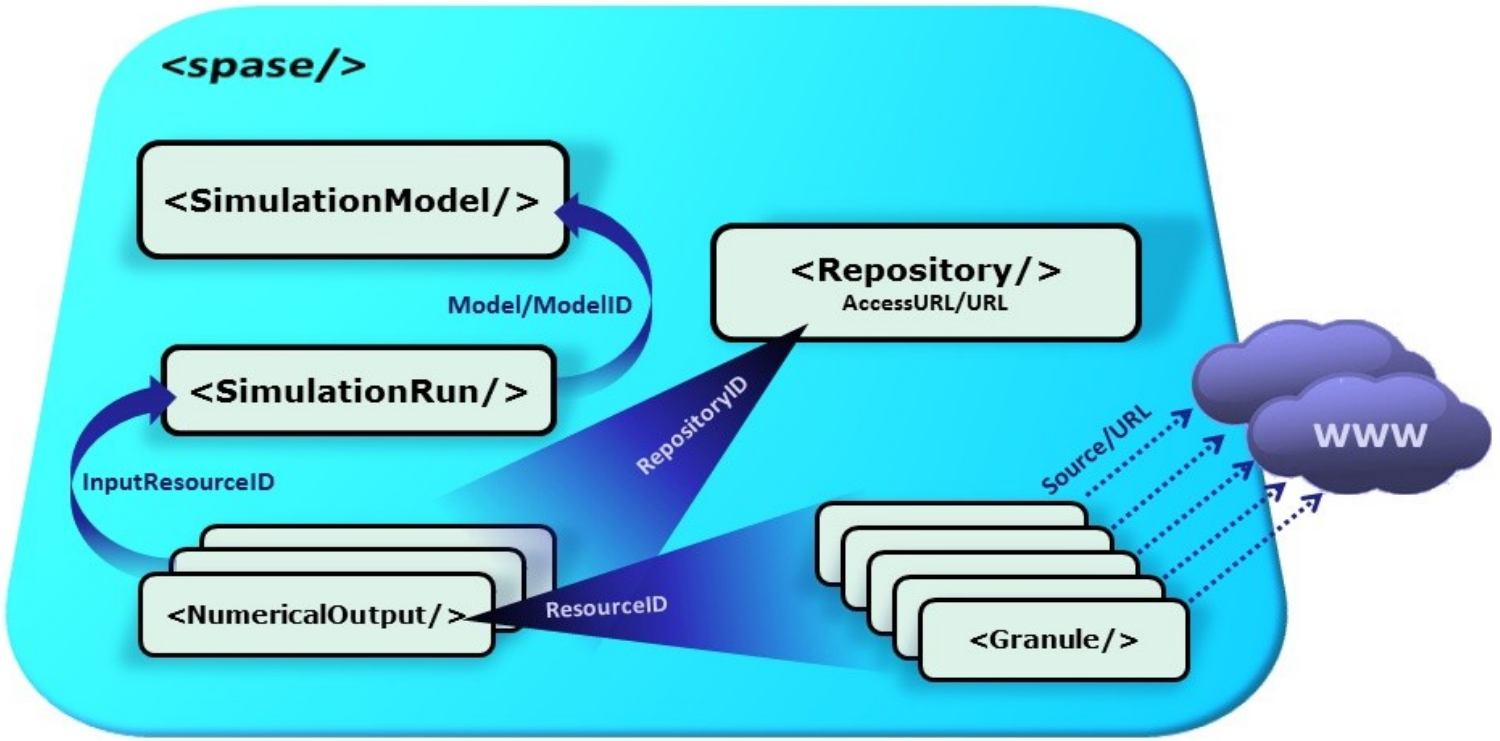
- **SimulationTime** : Duration, TimeStep
- **SimulationDomain** :
  - **CoordinateRepresentation** = spherical
  - **CoordinateSystemName** = GEO, IAU_MARS,…
  - **SpatialDimension** = 3
  - **CoordinateLabel** = altitude latgeo longeo



Simulation Run

- **ModelID**
- **RepositoryID**

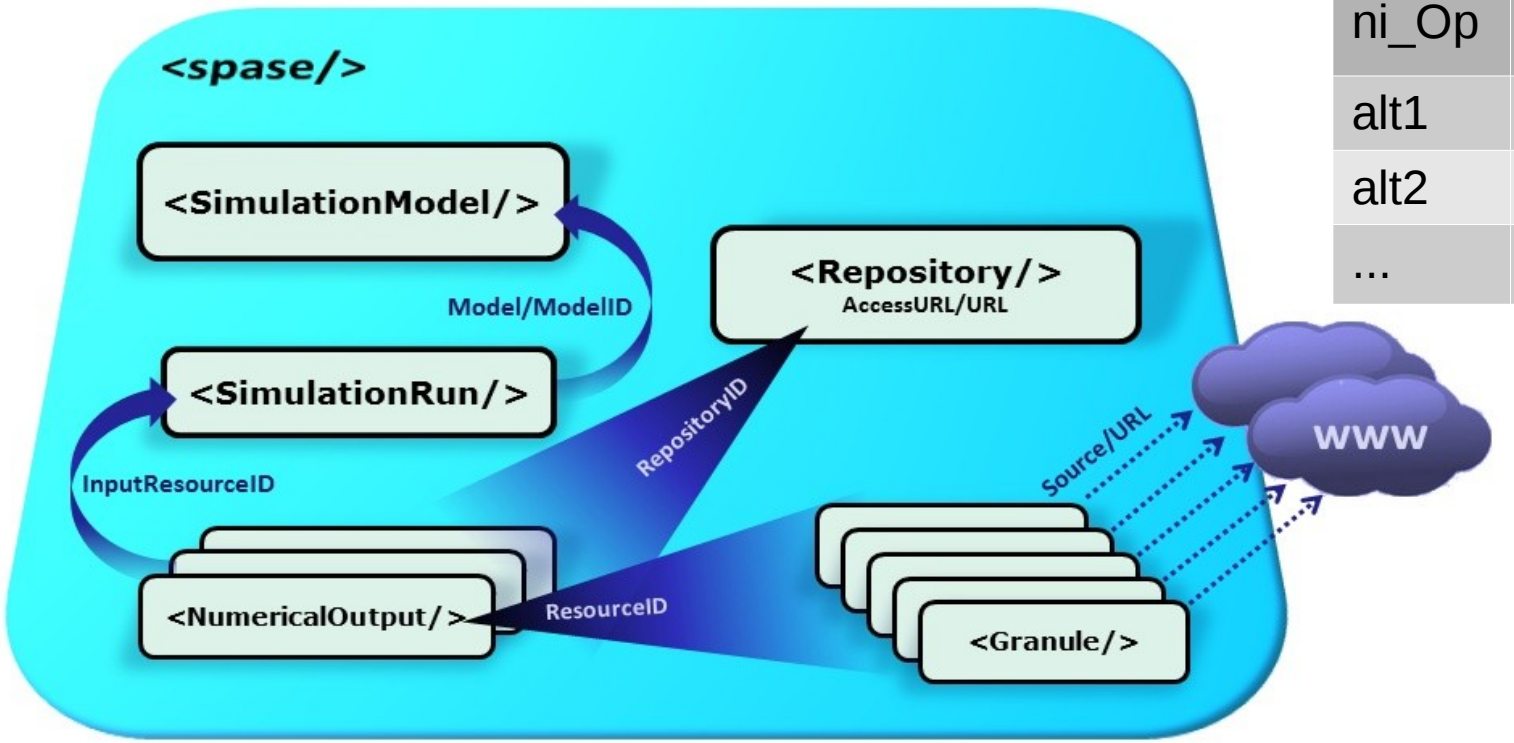
- **SimulationTime** : Duration, TimeStep
- **SimulationDomain** :
  - **CoordinateRepresentation** = spherical
  - **CoordinateSystemName** = GEO, IAU_MARS,…
  - **SpatialDimension** = 3
  - **CoordinateLabel** = altitude latgeo longeo
  - **ValidMin/ValidMax** ??
  - **GridStructure** ?? → exponential
  - **GridCellSize** ?? → variable...



Numerical Output

InputResourceID : simulationRun associated = **SimulationRunID**

TemporalDescription : StartDate and StopDate

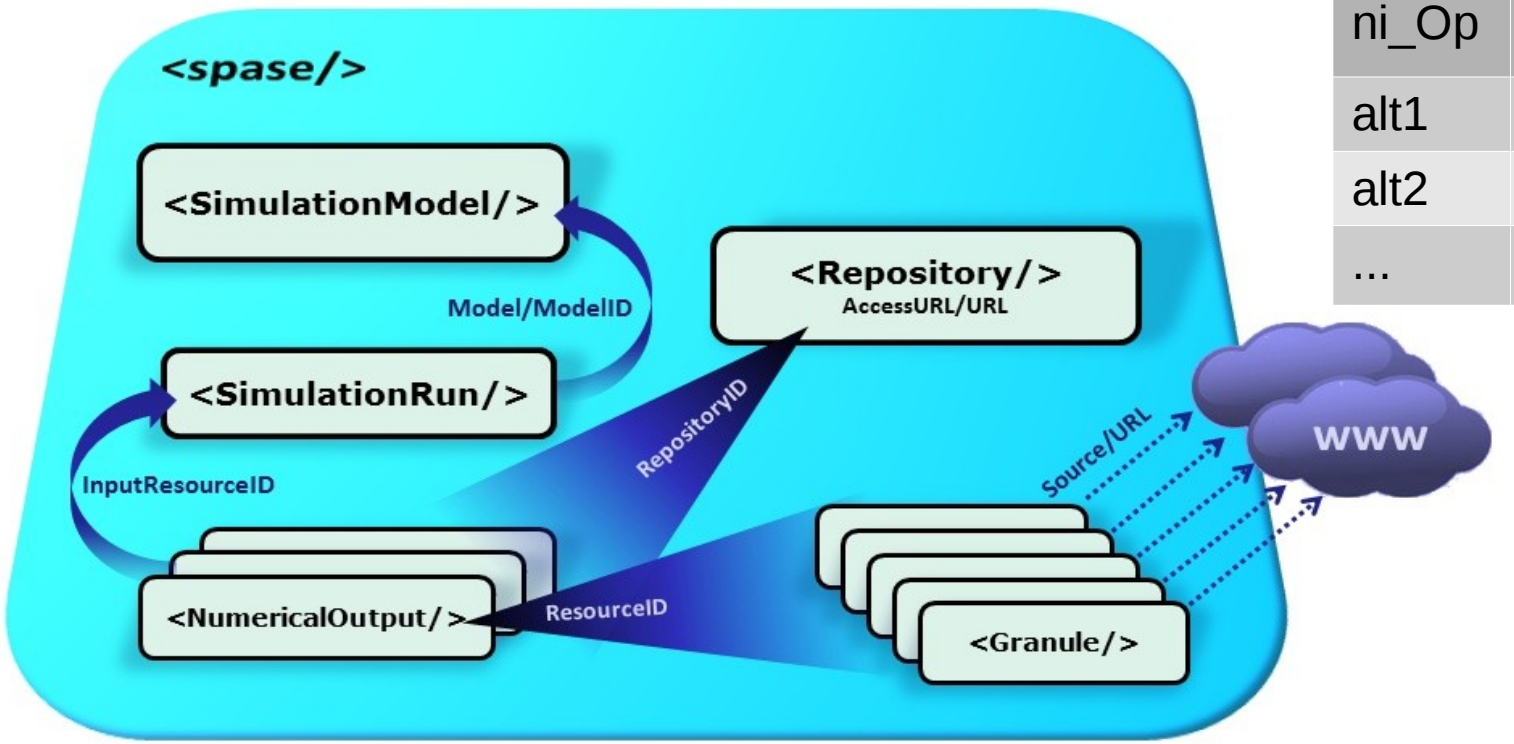


ni_Op	t1	t2	...
alt1			
alt2			
...			

NeutralGas **IonComposition**

O			H			O2			O+				NO+			
Nn	Un	Tn	Nn	Un	Tn	Nn	Un	Tn	Ni	Ui	Ti	Qi	Ni	Ui	Ti	Qi

- O NumericalOutput. MeasurementType = NeutralGas. Parameter = nn_O, un_O, tn_O
- H NumericalOutput. MeasurementType = NeutralGas. Parameter = nn_H, un_H, tn_H
- O2 NumericalOutput. MeasurementType = NeutralGas. Parameter = nn_O2, un_O2, tn_O2
- O+ NumericalOutput. MeasurementType = IonComposition. Parameter = ni_Op, ui_Op, ti_Op
- NO+ NumericalOutput. MeasurementType = IonComposition. Parameter = ni_NOp, ui_Nop,..



ni_Op	t1	t2	...
alt1			
alt2			
...			

NeutralGas **IonComposition**

O			H			O2			O+				NO+			
Nn	Un	Tn	Nn	Un	Tn	Nn	Un	Tn	Ni	Ui	Ti	Qi	Ni	Ui	Ti	Qi

- O NumericalOutput. MeasurementType = NeutralGas. Parameter = nn_O, un_O, tn_O
- H NumericalOutput. MeasurementType = NeutralGas. Parameter = nn_H, un_H, tn_H
- O2 NumericalOutput. MeasurementType = NeutralGas. Parameter = nn_O2, un_O2, tn_O2
- O+ NumericalOutput. MeasurementType = IonComposition. Parameter = ni_Op, ui_Op, ti_Op
- NO+ NumericalOutput. MeasurementType = IonComposition. Parameter = ni_NOp, ui_Nop,..

→ **only 1 cdf file… same URL...**

Additions/Modifications to IMPEx Data Model for TRANSPLANET

- Additions in the CoordinateSystemName enumeration
  - IAU_JUPITER, IAU_MARS
- Addition of **SimulationRunID** in NumericalOutput
  - to be compatible with SPASE Base
- VersionID replaced with **VersionTag**
- PopulationID replaced with **Population** to follow the SPASE rules for ID
- Addition of **UCD** in Parameter for compatibility with IVOA and **VESPA** (not yet in SPASE BASE 2.2.8 but planned in 2.2.9).
- **To be added** : Neutral (only Ion or Molecule), Mars.Nearsurface (only Mars) and Jupiter.Nearsurface