Standardizing Space Weather Data for Radiation Belt Modelling

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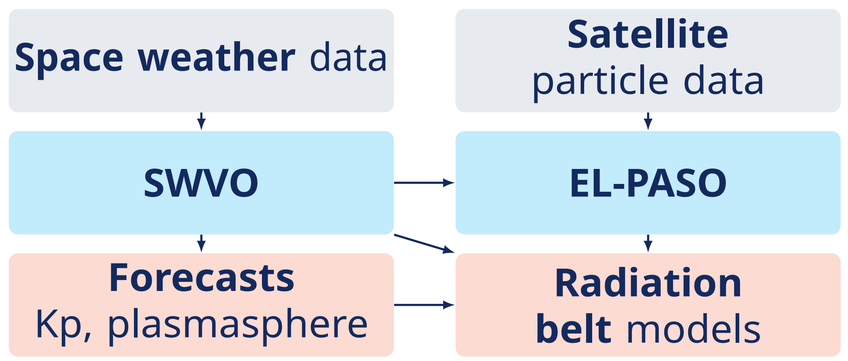
Introduction

The Problem

Radiation belt models need indices, solar wind, and particle data in many formats. **SWVO** (**S**olar **W**ind **V**irtual **O**bservatory) and **EL-PASO** (**EL**aborative **P**article **A**nalysis from **S**atellite **O**bservations) make them standard and model-ready.

From 24 data sources and missions to reproducible, model-ready radiation belt inputs.

From Data to Forecasts



Software

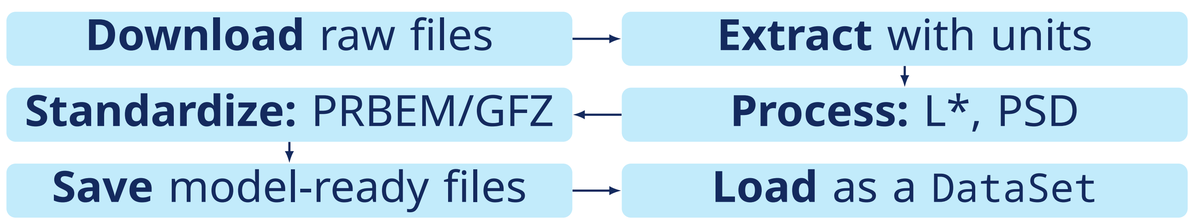
SWVO

One reader API for space weather data.

```
omni = SWOMNI().read(t0, t1)
ace = SWACE().read(t0, t1, propagation=True)
dscovr = DSCOVR().read(t0, t1, propagation=True)
midl = SWMIDL().read(t0, t1)
symh = SymhOMNI().read(t0, t1)
dst = DSTOMNI().read(t0, t1)  # or DSTWDC
kp = KpOMNI().read(t0, t1)  # or KpGFZ
```

EL-PASO

Standardize satellite data to model-ready files.




```
$ el-paso arase xep --start-time t0 --end-time t1
$ el-paso goes mps-high --start-time t0 --end-time t1
ds = GFZDataSet(strategy, t0, t1)
```

Plots

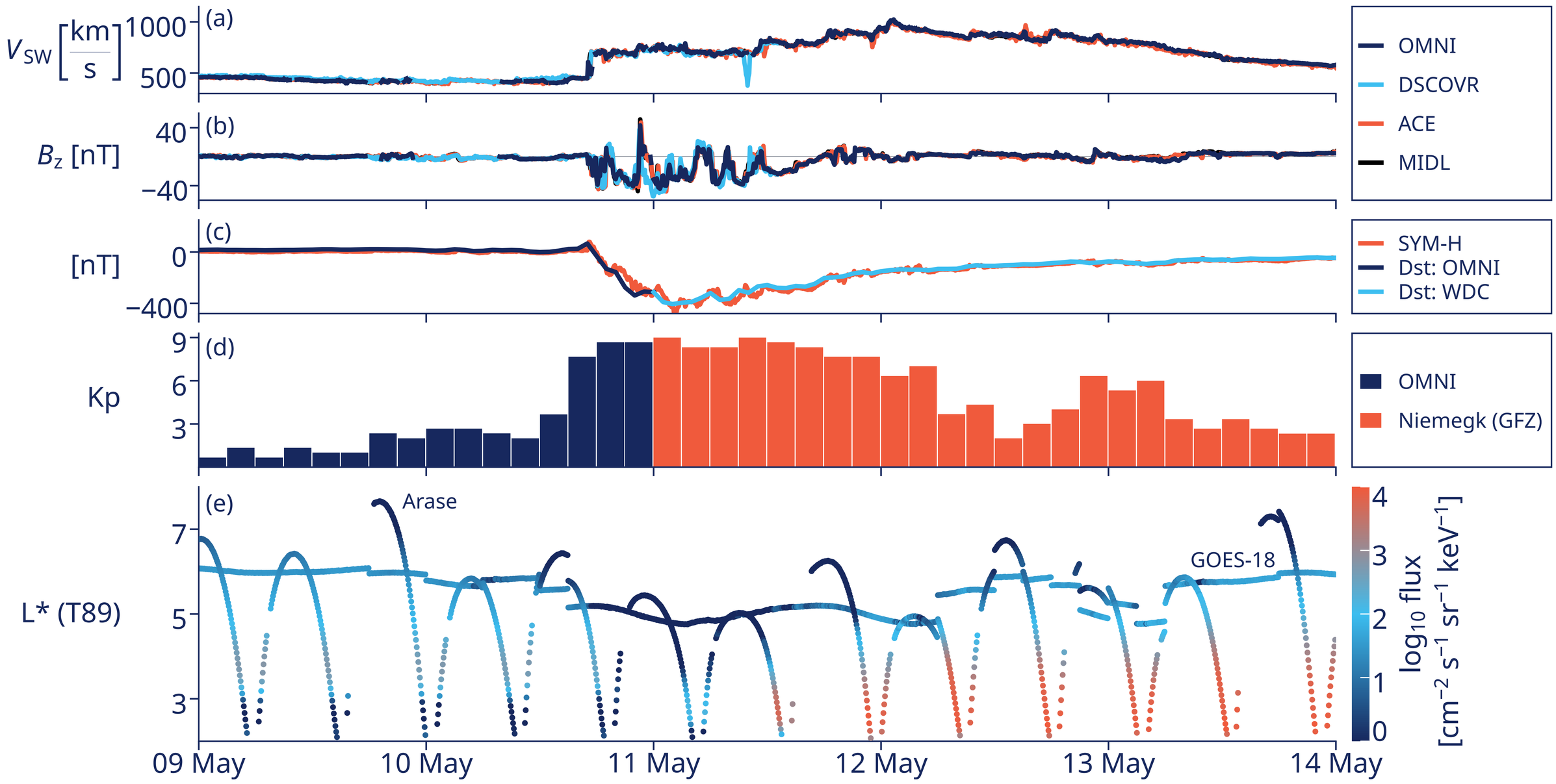


Figure: May 2024 (Gannon) storm. **Top (a, b, c and d):** V_{SW} and B_z from four sources, Kp and Dst from two, SYM-H from OMNI, via **SWVO**. **Bottom (e):** Arase and GOES-18 1 MeV electrons (30° pitch angle) vs L* via **EL-PASO**.

Summary

- **SWVO:** 15 space weather sources, one reader API
- **EL-PASO:** 9 missions, one model-ready standard
- **Open:** Apache-2.0, tested in CI **Contribute a mission**

github.com/GFZ/**SWVO** github.com/GFZ/**EL_PASO** **EL-PASO** Paper

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