

Incorporating Near Real-Time Surface E-Fields into Simulator GIC



PowerWorld Western Users
Group
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Outline

- Time Varying Electric Field Inputs for PowerWorld Simulator GIC
 - b3d (binary)
 - text file formats (dat, json)
- Inputs published by the National Oceanic and Atmospheric Administration (NOAA) Space Weather Prediction Center
- Example from October 3



Time Varying Electric Field Inputs

- One of four *Calculation Mode* options on *GIC Analysis Form* dialog
- Input File Specification

GIC Analysis Form

Calculation Mode

- Single Snapshot
- Time Varying Series Voltage Inputs
- Time Varying Electric Field Inputs
- Spatially Uniform Time-Varying E-Field

Calculate GIC Values Clear GIC Values Include GIC in Power Flow and Transient Stability Validate Input Data f...

Current Time: 0.00 Calculate GIC on Time Change

Select Step

- Field/Voltage Input
- Options
 - DC Current Calculati...
 - AC Power Flow Mod...
- Tables and Results
 - Areas
 - Buses

Field/Voltage Input

Non-uniform Electric Field Files (*.b3d, *.dat, *.json)

G:\Marketing\Western PowerWorld Users Group\October 2022\Present Browse...

Clear Existing Time Points or Merging

- Clear Existing
- Merge

Setup Time-Varying Series on Load

Save Non-uniform Fields in PWB File

Options for Loading Multiple Files of Selected Type

- Just selected file
- All after last time in Time Points List
- All before first time in TimePoints List
- All files of selected type



NOAA Space Weather Prediction Center

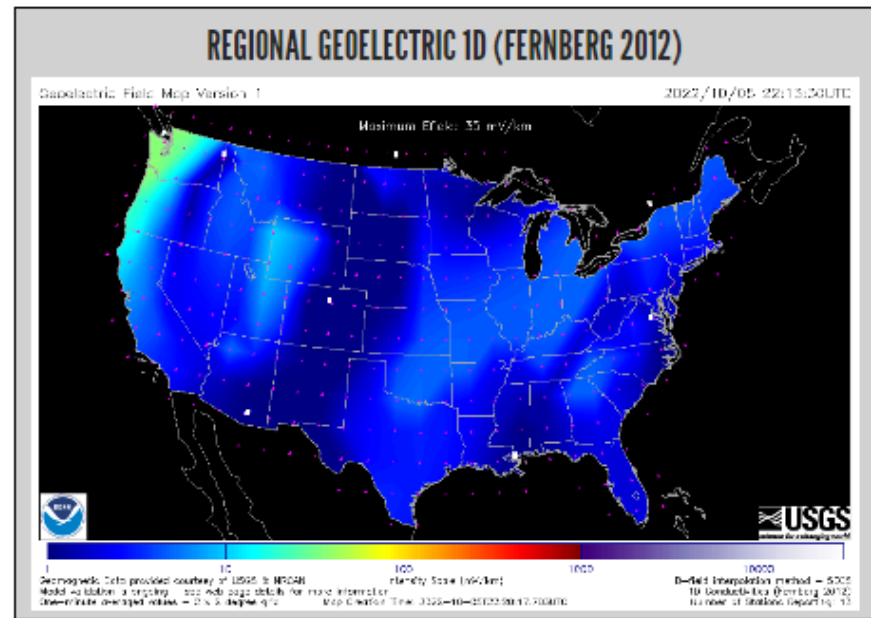
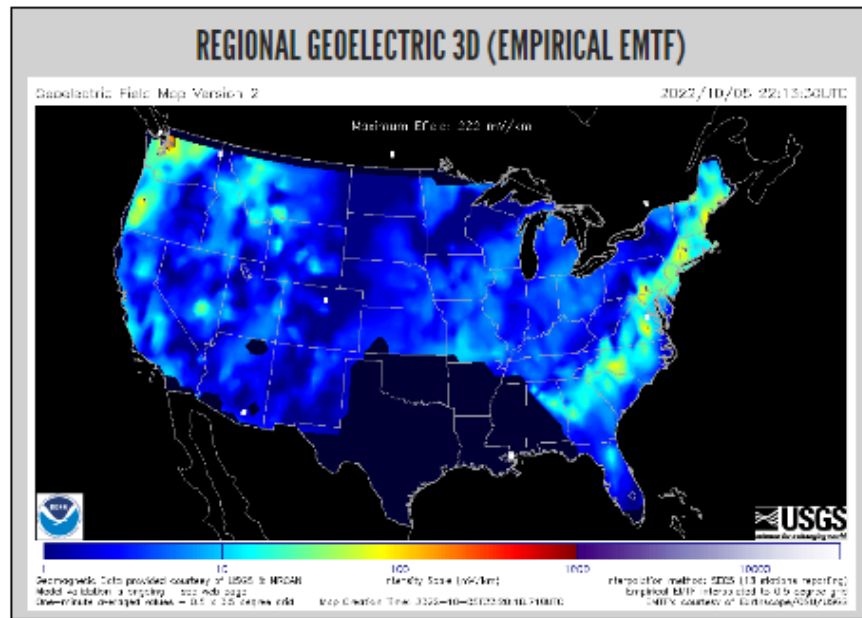
- <https://www.swpc.noaa.gov/news/new-json-data-now-available>
- “Beginning December 3, 2018, SWPC will be adding a variety of space weather data in the JSON format via our data service. Much of this data is currently available either on our website or FTP site... The root directory for the new JSON format data can be found here: <https://services.swpc.noaa.gov/json>”



NOAA Space Weather Prediction Center

- E-Fields based on 3D (NSF EarthScope USArray project) and 1D (Fernberg 2012) Earth Conductivity Models

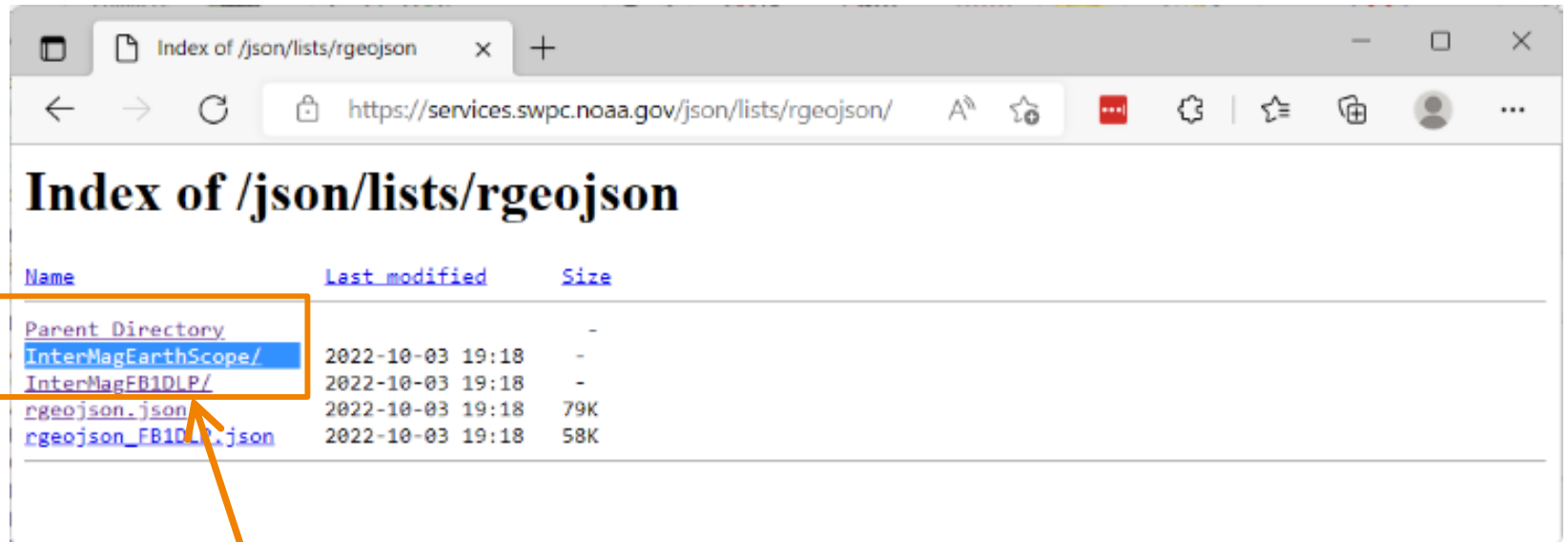
GEOELECTRIC 3D-1D COMPARISON





NOAA Space Weather Prediction Center

- Navigate to <https://services.swpc.noaa.gov/json/lists/rgeojson/>



InterMagEarthScope: 3D Earth Model
InterMagFB1DLP: 1D Earth Model



Demo: October 3 Data

- 3D Data from InterMagEarthScope
- 21 minutes of data
 - 1-minute time resolution
 - 0.5 x 0.5 degree spatial resolution

Time Points (Select Point to Preview)						
	Time Offset, Seconds	Maximum Electric Field, V/km	Maximum Electric Field Longitude	Maximum Electric Field Angle Latitude	Save in File	Date/Time String
1	0.000	0.199	-70.0000	43.5000	YES	10/3/2022 6:29:30 AM
2	60.000	0.174	-70.0000	43.5000	YES	10/3/2022 6:30:30 AM
3	120.000	0.135	-70.0000	43.5000	YES	10/3/2022 6:31:30 AM
4	180.000	0.104	-70.0000	43.5000	YES	10/3/2022 6:32:30 AM
5	240.000	0.094	-70.0000	43.5000	YES	10/3/2022 6:33:30 AM
6	300.000	0.087	-92.0000	47.5000	YES	10/3/2022 6:34:30 AM
7	360.000	0.097	-92.0000	47.5000	YES	10/3/2022 6:35:30 AM
8	420.000	0.148	-110.0000	43.5000	YES	10/3/2022 6:36:30 AM
9	480.000	0.164	-110.0000	43.5000	YES	10/3/2022 6:37:30 AM
10	540.000	0.143	-110.0000	43.5000	YES	10/3/2022 6:38:30 AM
11	600.000	0.118	-110.0000	43.5000	YES	10/3/2022 6:39:30 AM
12	660.000	0.106	-110.0000	43.5000	YES	10/3/2022 6:40:30 AM
13	720.000	0.095	-110.0000	43.5000	YES	10/3/2022 6:41:30 AM
14	780.000	0.100	-71.0000	45.0000	YES	10/3/2022 6:42:30 AM
15	840.000	0.086	-110.0000	43.5000	YES	10/3/2022 6:43:30 AM
16	900.000	0.070	-110.0000	43.5000	YES	10/3/2022 6:44:30 AM
17	960.000	0.066	-92.0000	47.5000	YES	10/3/2022 6:45:30 AM
18	1020.000	0.059	-86.0000	33.5000	YES	10/3/2022 6:46:30 AM
19	1080.000	0.066	-92.0000	47.5000	YES	10/3/2022 6:47:30 AM
20	1140.000	0.053	-110.0000	43.5000	YES	10/3/2022 6:48:30 AM
21	1200.000	0.037	-77.5000	37.5000	YES	10/3/2022 6:49:30 AM
22	1260.000	0.054	-77.5000	37.5000	YES	10/3/2022 6:50:30 AM



E-Field Magnitude: 1st Timepoint

