Documentation for the helper script that writes out a SEP data formatted JSON file

sep_json_writer.py Description

This program is supposed to help the modeler to provide their model data to the CCMC in the required JSON format.

There are three ways you can get your data to the script.

1. Via command line arguments (see 'Command Line Arguments' section below for a detailed list)
2. By printing out your data in a python dictionary format (which is essentially a JSON format, so think twice before you use this, as it may not be a good use of your time) into a file and then running the sep_json_writer.py (see Example 1 below).
3. By importing the ConvertToJSON class from the sep_json_writer.py script and calling it directly (see Example 2 below).

Contact Joycelyn Jones in the CCMC at joycelyn.t.jones@nasa.gov for additional assistance.

Command Line Arguments

-h, --help show this help message and exit

-o OUTPUT_FILE_BASENAME, --output OUTPUT_FILE_BASENAME
Beginning of JSON output filename. Default is the <model_short_name>.<prediction_window_start_time>.<issue_time>.

-d OUTPUT_DIR, --output-dir OUTPUT_DIR
Full path to output directory. Default is current directory.

-n, --no-logging Turn off logging. It is turned on by default.

-l LOG_DIR, --log-dir LOG_DIR Full path to log directory. Default is current directory.

-b LOG_STARTER, --log-basename LOG_STARTER Beginning of the log filename (date and time will be added automatically). Default is 'isep_model_run'.

--import-data-dictionary import the data dictionary from a file

--data-dictionary full path to the file containing the data dictionary (which MUST be named 'sep_forecast_submission_dataDict'). NOTE: this is ignored if --import-data-dictionary is not used.

--contact-name [CONTACT_NAME [CONTACT_NAME ...]] Model developer/administrator POCs, in case of datastream issues or model questions. (At least one is required, more than one is allowed)

--contact-email CONTACT_EMAIL Contact email (One per contact-name required).

--model-short-name [MODEL_SHORT_NAME [MODEL_SHORT_NAME ...]] Short name (e.g. acronym) of model to appear on scoreboard. Consider including version number with acronym if distinction needed. 30 character limit. (Required)

--spase-id SPASE_ID Link to URL of full model description metadata in CCMC metadata registry in SPASE format (contact CCMC to register your model). (Required)

--issue-time ISSUE_TIME Forecast issue time (e.g. model run is complete and forecast is created). (Required)

--mode MODE Allowed values: forecast, historical. Default is 'forecast'. (Optional)

--cme-start-time CME_START_TIME Provide if forecast is issued based on a CME trigger. Timestamp of 1st coronagraph image CME is visible in. (Optional)

--cme-liftoff-time CME_LIFTOFF_TIME Timestamp of coronagraph image with 1st indication of CME liftoff (used by CACTUS). (Optional)

--cme-lat CME_LAT CME latitude (deg). (Optional)

--cme-lon CME_LON CME latitude (deg). (Optional)

--cme-pa CME_PA CME plane-of-sky position angle (measured from solar north in degrees counter-clockwise). (Optional)

--cme-half-width CME_HALF_WIDTH CME half-width (deg). (Optional)

--cme-speed CME_SPEED CME speed (km/s). (Optional)

--cme-acceleration CME_ACCELERATION CME acceleration (km/s^2). (Optional)

--cme-height CME_HEIGHT CME height at which the above parameters were derived (solar radii from Sun center). (Optional)

--cme-time-at-height-time CME_TIME_AT_HEIGHT_TIME CME time at specificied height. (Optional, required with cme_time_at_height_height)

--cme-time-at-height-height CME_TIME_AT_HEIGHT_HEIGHT Specificied height in solar radii. (Optional, required with cme_time_at_height_time)

--cme-coordinates CME_COORDINATES Coordinate system for CME lat/lon parameters (e.g. HEEQ or Carrington) (Optional, required with lat or lon)

--cme-catalog CME_CATALOG Name of catalog where CME information was pulled from. Allowed values: ARTEMIS, DONKI, HELCATS, JHU APL, CACTUS_NRL, CACTUS_SIDC, CORIMP, SEEDS, SOHO_CDAW, STEREO_COR1 (contact us to add a new catalog name) (Optional)

--cme-catalog-id CME_CATALOG_ID ID value for the catalog where CME information was pulled from. (Required if catalog is DONKI, optional otherwise)

--cme-urls [CME_URLS [CME_URLS ...]] List of urls where CME information can be found, or information was pulled from. (Optional,
more than one is allowed)

--flare-last-data-time FLARE_LAST_DATA_TIME Last time data timestamp that was used to create forecast (relevant for forecasts issued before
flare end times) (Optional)
--flare-start-time FLARE_START_TIME Flare start time (Optional, required it flare-last-data-time used)
--flare-peak-time FLARE_PEAK_TIME Flare peak time (Optional)
--flare-end-time FLARE_END_TIME Flare end time (Optional)
--flare-location FLARE_LOCATION Flare location in Stonyhurst coordinates (i.e., N00W00/S00E00 format). (Optional)
--flare-intensity FLARE_INTENSITY Flare intensity (W/m^2) (Optional)
--flare-integrated-intensity FLARE_INTEGRATED_INTENSITY Flare integrated intensity (J/m^2) (Optional)
--flare-noaa-region FLARE_NOAA_REGION Associated NOAA active region number (including the preceding 1) (Optional)
--flare-urls [FLARE_URLS [FLARE_URLS ...]] List of urls where flare information can be found, or information was pulled from. (Optional, more than one is allowed)
--cme-sim-model CME_SIM_MODEL Model name (Optional)
--cme-sim-completion-time CME_SIM_COMPLETION_TIME Simulation completion time (Optional, required if cme-sim-model is used)
--cme-sim-urls [CME_SIM_URLS [CME_SIM_URLS ...]] List of urls where simulation information can be found, or information was pulled from. (Optional, more than one is allowed)
--pi-observatory PI_OBSERVATORY Name of observatory/spacecraft data are from. (Optional)
--pi-instrument PI_INSTRUMENT Name of instrument data are from. (Optional, required if pi-observatory used)
--pi-last-data-time PI_LAST_DATA_TIME Last time data timestamp used to create forecast. (Optional, required if pi-observatory used)
--pi-ongoing-events-start-time [PI_ONGOING_EVENTS_START_TIME [PI_ONGOING_EVENTS_START_TIME ...]] If an ongoing event triggers your forecast, this is the start time. (Optional)
--pi-ongoing-events-threshold [PI_ONGOING_EVENTS_THRESHOLD [PI_ONGOING_EVENTS_THRESHOLD ...]] If an ongoing event triggers your forecast, this is the threshold used to define the event in pfu. (Optional, required if pi-ongoing-events-start-time used)
--pi-ongoing-events-energy-min [PI_ONGOING_EVENTS_ENERGY_MIN [PI_ONGOING_EVENTS_ENERGY_MIN ...]] If an ongoing event triggers your forecast, this is the min of energy channel range in MeV. (Optional, required if pi-ongoing-events-start-time used)
--pi-ongoing-events-energy-max [PI_ONGOING_EVENTS_ENERGY_MAX [PI_ONGOING_EVENTS_ENERGY_MAX ...]]

If an ongoing event triggers your forecast, this is the max of energy channel range in MeV. -1 represents an unbounded integral channel. (Optional, required if pi-ongoing-events-start-time used)

--energy-min ENERGY_MIN Min of energy channel range. (Required)

--energy-max ENERGY_MAX Max of energy channel range. -1 represented an unbounded integral channel. (Required)

--energy-units ENERGY_UNITS Energy channel units (Required)

--species SPECIES Allowed values: electron, proton, helium, helium3, helium4, oxygen, iron, ion. (Required)

--location LOCATION Allowed values: mercury, venus, earth, mars, psp, stereoa, stereob, dawn, juno, L1, L2, L4, L5. (Required)

--prediction-window PREDICTION_WINDOW PREDICTION_WINDOW Start time and end time (in that order) of the prediction window that is relevant to the given data. Start of forecast prediction window must be within one hour of forecast issue time when in 'forecast' mode. (Required)

--peak-intensity PEAK_INTENSITY Forecast peak intensity value. (Optional)

--peak-intensity-units PEAK_INTENSITY_UNITS Forecast peak intensity value units. (Optional, required if peak-intensity used)

--peak-intensity-uncertainty PEAK_INTENSITY_UNCERTAINTY Forecast peak intensity uncertainty value (same units as peak intensity). (Optional)

--peak-intensity-time PEAK_INTENSITY_TIME Forecast time for reaching peak intensity value. (Optional)

--peak-intensity-esp PEAK_INTENSITY_ESP Forecast peak intensity value in the vicinity of shock passage. (Optional)

--peak-intensity-esp-units PEAK_INTENSITY_ESP_UNITS Forecast peak intensity units in the vicinity of shock passage. (Optional, required if peak-intensity-esp used)

--peak-intensity-esp-time PEAK_INTENSITY_ESP_TIME Forecast time for reaching peak intensity value in the vicinity of shock passage. (Optional)

--fluences FLUENCES Forecast fluence value (corresponds to event length). (Optional, more than one is allowed)

--fluence-units FLUENCE_UNITS Forecast fluence units. (Optional, required if fluence used, more than one is allowed and has to match up with the fluence values)

--event-length-start-times EVENT_LENGTH_START_TIMES Event length must fall within prediction window. Forecast energetic particle event start time ('onset' time). (Optional, more than one is allowed)

--event-length-end-times EVENT_LENGTH_END_TIMES Forecast energetic particle event end time. (Optional, more than one is allowed)

--event-length-thresholds EVENT_LENGTH_THRESHOLDS Threshold used to extract start and end times. (Optional, required if event-length-start-time used, more than one is allowed)

--event-length-threshold-units EVENT_LENGTH_THRESHOLD_UNITS Units of threshold. (Optional, required if event-length-start-time used, more than one is allowed)

--thresh-crossing-times [THRESH_CROSSING_TIMES [THRESH_CROSSING_TIMES ...]] Multiple threshold_crossings can be provided for the same forecast energy channel. Forecast threshold crossing time. (Optional, more than one is allowed)

--thresh-uncertainties [THRESH_UNCERTAINTIES [THRESH_UNCERTAINTIES ...]] Forecast crossing time uncertainty in hours. (Optional, more than one is allowed)

--crossing-thresholds [CROSSING_THRESHOLDS [CROSSING_THRESHOLDS ...]] Particle intensity threshold value crossing time refers to. (Optional, required if thresh-crossing-times used, more than one is allowed)

--crossing-threshold-units [CROSSING_THRESHOLD_UNITS [CROSSING_THRESHOLD_UNITS ...]] Units of threshold. (Optional, required if thresh-crossing-times used, more than one is allowed)

--probabilities [PROBABILITIES [PROBABILITIES ...]] Multiple probabilities can be provided for the same forecast energy channel. forecast probability value (range 0 to 1). (Optional, more than one is allowed)

--prob-uncertainties [PROB_UNCERTAINTIES [PROB_UNCERTAINTIES ...]] Plus/minus error bar for probability_value (in probability_value units). (Optional, more than one is allowed)

--prob-thresholds [PROB_THRESHOLDS [PROB_THRESHOLDS ...]] Particle intensity threshold value probability forecast refers to. (Optional, required if probabilities is used, more than one is allowed)

--prob-threshold-units [PROB_THRESHOLD_UNITS [PROB_THRESHOLD_UNITS ...]] Units of threshold. (Optional, required if probabilities is used, more than one is allowed)

--all-clear ALL_CLEAR There are three situations for setting all_clear_boolean=false:

(1) for >10MeV energy channel, your forecast of peak intensity OR threshold crossing exceeds 10 pfu OR your probability forecast for a threshold of 10 pfu exceeds your custom probability_threshold;

(2) for the >100MeV energy channel, your forecast of peak intensity OR threshold crossing exceeds 1 pfu OR your probability forecast for a threshold of 1 pfu exceeds your custom probability_threshold;

(3) for your custom (non-integral) energy channel, your forecast peak intensity OR threshold crossing exceeds your custom threshold.

Custom cases (3) are being stored but will not be used in the all-clear scoreboard display. (Optional)

--all-clear-threshold ALL_CLEAR_THRESHOLD Particle intensity threshold value all_clear_boolean refers to. Can be 10 pfu for >10MeV channel, 1 pfu for >100MeV channel, or a custom threshold value. (Optional, required if all-clear is used)

--all-clear-threshold-units ALL_CLEAR_THRESHOLD_UNITS Units of threshold. (Optional, required if all-clear is used)

--all-clear-probability-threshold ALL_CLEAR_PROBABILITY_THRESHOLD Probability threshold value all_clear_boolean refers to. Must specify this threshold if setting all_clear_boolean based on probability forecast. (Optional)
--sep-profile SEP_PROFILE Text file with 2 columns: datetime string and predicted SEP intensity for this energy channel. (Optional)
--native-id NATIVE_ID Specify only if forecast has a native id from your model run. (Optional)

Use Examples

Example 1 - Library import

Create a file with a ".py" extension.
Inside it, put a python dictionary named sep_forecast_submission_dataDict.
So your file will look like
sep_forecast_submission_dataDict = {
…lots of data here in a python dictionary format...
}
Then run the script with
./sep_json_writer.py --import-data-dictionary –data-dictionary <full_path_to_file.py>

Example 2 - Class call

Inside your python program:
1. Define dataD as a python dictionary with all your values (see sep_example_python_dictionary_format.py as an example)
2. Set the following variables:
- output_file_basename (string, the basename you want the output file to have, otherwise it will be <model name>.<prediction_window_start>.<issue_time>.json)
- output_dir (string, full path to directory to hold the output JSON files)
- log_msgs (boolean, True if you want to log messages, False if you don't)
- log_dir (string, full path to log directory. Feel free to use './', the current directory.)
- log_starter (string, beginning of the log filename, date and time will be added automatically). Suggested value is 'isep_model_run'.

3. Add the following to your code:
from sep_json_writer import ConvertToJSON
ConvertToJSON(dataD, output_file_basename, output_dir, log_msgs, log_dir, log_starter)

Example 3 - Command line example

./sep_json_writer.py --contact-name David Falconer --contact-email david.a.falconer@nasa.gov --contact-name Igor Khazanov --contact-email igor.khazanov@uah.edu --model-short-name MAG4-LOS-FE --spase-id spase://CCMC/SimulationModel/MAG4/v20190127 --issue-time

2017-09-10T23:30Z --mode forecast --energy-min 10 --energy-max -1 --energy-units MeV --species proton --location earth --prediction-window 2017-09-11T00:00Z 2017-09-11T23:59Z --probabilities 0.85 --prob-uncertainties 0.08 --prob-thresholds 10 --prob-threshold-units pfu --all-clear False --all-clear-threshold 10.0 --all-clear-threshold-units pfu --all-clear-probability-threshold 0.3

Here's that same example in a more human-readable format:
./sep_json_writer.py
--contact-name David Falconer
--contact-email david.a.falconer@nasa.gov
--contact-name Igor Khazanov
--contact-email igor.khazanov@uah.edu
--model-short-name MAG4-LOS-FE
--spase-id spase://CCMC/SimulationModel/MAG4/v20190127
--issue-time 2017-09-10T23:30Z
--mode forecast
--energy-min 10
--energy-max -1
--energy-units MeV
--species proton
--location earth
--prediction-window 2017-09-11T00:00Z 2017-09-11T23:59Z
--probabilities 0.85
--prob-uncertainties 0.08
--prob-thresholds 10
--prob-threshold-units pfu
--all-clear False
--all-clear-threshold 10.0
--all-clear-threshold-units pfu
--all-clear-probability-threshold 0.3

Example 4 - Another command line example, with multiple probability forecasts

./sep_json_writer.py --contact-name David Falconer --contact-email david.a.falconer@nasa.gov --contact-name Igor Khazanov --contact-email igor.khazanov@uah.edu --model-short-name MAG4_LOS_FE --spase-id spase://CCMC/SimulationModel/MAG4/v20190127 --issue-time 2017-09-10T23:30Z –mode forecast --energy-min 10 --energy-max -1 --energy-units MeV --species proton --location earth --prediction-window 2017-09-11T00:00Z 2017-09-11T23:59Z --probabilities 0.85 0.22 --prob-uncertainties 0.08 None --prob-thresholds 10 100.0 --prob-threshold-units pfu pfu --all-clear False --all-clear-threshold 10.0 --all-clear-threshold-units pfu --all-clear-probability-threshold 0.3 --energy-min 100 --energy-max -1 --energy-units MeV –species proton --location earth --prediction-window 2017-09-11T00:00Z 2017-09-11T23:59Z –probabilities 0.01 --prob-uncertainties None --prob-thresholds 1 --prob-threshold-units pfu --all-clear True --all-clear-threshold 1.0 --all-clear-threshold-units pfu --all-clear-probability-threshold 0.2

Here's that same example in a more human-readable format:

```
./sep_json_writer.py
--contact-name David Falconer
--contact-email david.a.falconer@nasa.gov
--contact-name Igor Khazanov
--contact-email igor.khazanov@uah.edu
--model-short-name MAG4_LOS_FE
--spase-id spase://CCMC/SimulationModel/MAG4/v20190127
--issue-time 2017-09-10T23:30Z
--mode forecast
--energy-min 10
--energy-max -1
--energy-units MeV
--species proton
--location earth
--prediction-window 2017-09-11T00:00Z 2017-09-11T23:59Z
--probabilities 0.85 0.22
--prob-uncertainties 0.08 None
--prob-thresholds 10 100.0
--prob-threshold-units pfu pfu
--all-clear False
--all-clear-threshold 10.0
--all-clear-threshold-units pfu
--all-clear-probability-threshold 0.3
--energy-min 100
--energy-max -1
--energy-units MeV
--species proton
--location earth
--prediction-window 2017-09-11T00:00Z 2017-09-11T23:59Z
--probabilities 0.01
--prob-uncertainties None
--prob-thresholds 1
--prob-threshold-units pfu
--all-clear True
--all-clear-threshold 1.0
--all-clear-threshold-units pfu
--all-clear-probability-threshold 0.2
```

Example 5 - A more complete command line example

```
./sep_json_writer.py --contact-name Model Developer Name1 --contact-email
developer1@email.com --model-short-name MODEL ACRONYM --spase-id
```

spase://CCMC/SimulationModel/MODEL_NAME1/VERSION --issue-time 2017-09-10T20:00Z
--mode forecast --cme-start-time 2017-09-10T16:06Z --cme-lat -9 --cme-lon 108
--cme-pa 261 --cme-half-width 70 --cme-speed 2500 --cme-height 21.5
--cme-time-at-height-time 2017-09-10T17:15Z --cme-time-at-height-height 21.5
--cme-coordinates HEEQ --cme-catalog DONKI --cme-urls
https://kauai.ccmc.gsfc.nasa.gov/DONKI/view/CME/13107/4 --cme-sim-model
WSA-ENLIL+Cone --cme-sim-completion-time 2017-09-11T09:42Z --cme-sim-urls
https://kauai.ccmc.gsfc.nasa.gov/DONKI/view/WSA-ENLIL/13114/1 --energy-min 10
--energy-max -1 --energy-units MeV --species proton --location earth
--prediction-window 2017-09-10T17:15Z 2017-09-17T00:00Z --peak-intensity 1000.0
--peak-intensity-units pfu --peak-intensity-time 2017-09-11T00:00Z
--peak-intensity-esp 100 --peak-intensity-esp-units pfu
--peak-intensity-esp-time 2017-09-13T00:00Z --event-length-start-time
2017-09-10T22:00Z --event-length-end-time 2017-09-13T00:00Z
--event-length-threshold 1.0 --event-length-threshold-units pfu
--thresh-crossing-times 2017-09-10T22:00Z --crossing-thresholds 10.0
--crossing-threshold-units pfu --all-clear false --all-clear-threshold 10.0
--all-clear-threshold-units pfu --sep-profile samplesepprofile10MeV.txt
--energy-min 100 --energy-max -1 --energy-units MeV --species proton --location
earth --prediction-window 2017-09-10T19:30Z 2017-09-17T22:30Z --peak-intensity
10.0 --peak-intensity-units pfu --peak-intensity-time 2017-09-11T01:00Z
--peak-intensity-esp None --peak-intensity-esp-units None
--peak-intensity-esp-time None --event-length-start-times 2017-09-10T22:00Z 2017-09-
10T23:00Z --event-length-end-times 2017-09-12T00:00Z 2017-09-12T00:00Z --event-length-
thresholds 0.3 0.5 --event-length-threshold-units pfu pfu --thresh-crossing-times 2017-09-
10T22:00Z --crossing-thresholds 1.0 --crossing-threshold-units pfu --all-clear false
--all-clear-threshold 1.0 --all-clear-threshold-units pfu --sep-profile samplesepprofile100MeV.txt

Here's that same example in a more human-readable format:
./sep_json_writer.py
--contact-name Model Developer Name1
--contact-email developer1@email.com
--model-short-name MODEL ACRONYM
--spase-id spase://CCMC/SimulationModel/MODEL_NAME1/VERSION
--issue-time 2017-09-10T20:00Z
--mode forecast
--cme-start-time 2017-09-10T16:06Z
--cme-lat -9
--cme-lon 108
--cme-pa 261
--cme-half-width 70
--cme-speed 2500
--cme-height 21.5
--cme-time-at-height-time 2017-09-10T17:15Z

--cme-time-at-height-height 21.5
--cme-coordinates HEEQ
--cme-catalog DONKI
--cme-urls https://kauai.ccmc.gsfc.nasa.gov/DONKI/view/CME/13107/4
--cme-sim-model WSA-ENLIL+Cone
--cme-sim-completion-time 2017-09-11T09:42Z
--cme-sim-urls https://kauai.ccmc.gsfc.nasa.gov/DONKI/view/WSA-ENLIL/13114/1
--energy-min 10
--energy-max -1
--energy-units MeV
--species proton
--location earth
--prediction-window 2017-09-10T17:15Z 2017-09-17T00:00Z
--peak-intensity 1000.0
--peak-intensity-units pfu
--peak-intensity-time 2017-09-11T00:00Z
--peak-intensity-esp 100
--peak-intensity-esp-units pfu
--peak-intensity-esp-time 2017-09-13T00:00Z
--event-length-start-time 2017-09-10T22:00Z
--event-length-end-time 2017-09-13T00:00Z
--event-length-threshold 1.0
--event-length-threshold-units pfu
--thresh-crossing-times 2017-09-10T22:00Z
--crossing-thresholds 10.0
--crossing-threshold-units pfu
--all-clear false
--all-clear-threshold 10.0
--all-clear-threshold-units pfu
--sep-profile samplesepprofile10MeV.txt
--energy-min 100
--energy-max -1
--energy-units MeV
--species proton
--location earth
--prediction-window 2017-09-10T19:30Z 2017-09-17T22:30Z
--peak-intensity 10.0
--peak-intensity-units pfu
--peak-intensity-time 2017-09-11T01:00Z
--peak-intensity-esp None
--peak-intensity-esp-units None
--peak-intensity-esp-time None
--event-length-start-time 2017-09-10T22:00Z 2017-09-10T23:00Z
--event-length-end-time 2017-09-12T00:00Z 2017-09-12T00:00Z

--event-length-threshold 0.3 0.5
--event-length-threshold-units pfu pfu
--thresh-crossing-times 2017-09-10T22:00Z
--crossing-thresholds 1.0
--crossing-threshold-units pfu
--all-clear false
--all-clear-threshold 1.0
--all-clear-threshold-units pfu
--sep-profile samplesepprofile100MeV.txt

JSON Output from the Previous Examples

Example 3's JSON Output


```
{
    "sep_forecast_submission": {
        "contacts": [
            {
                "name": "David Falconer",
                "email": "david.a.falconer@nasa.gov"
            },
            {
                "name": "Igor Khazanov",
                "email": "igor.khazanov@uah.edu"
            }
        ],
        "model": {
            "short_name": "MAG4-LOS-FE",
            "spase_id": "spase://CCMC/SimulationModel/MAG4/v20190127"
        },
        "issue_time": "2017-09-10T23:30Z",
        "mode": "forecast",
        "forecasts": [
            {
                "energy_channel": {
                    "min": 10,
                    "max": -1,
                    "units": "MeV"
                },
                "species": "proton",
                "location": "earth",
                "prediction_window": {
                    "start_time": "2017-09-11T00:00Z",
                    "end_time": "2017-09-11T23:59Z"
```

```
                        },
                        "probabilities": [
                                {
                                        "probability_value": 0.85,
                                        "uncertainty": 0.08,
                                        "threshold": 10,
                                        "threshold_units": "pfu"
                                }
                        ],
                        "all_clear": {
                                "all_clear_boolean": false,
                                "threshold": 10.0,
                                "threshold_units": “pfu",
                                "probability_threshold": 0.3
                        }
                }
        ]
    }
}
```


Example 4’s JSON Output


```
{ "sep_forecast_submission":
    {
        "contacts":
        [
            {
                "name": "David Falconer",
                "email": "david.a.falconer@nasa.gov"
            },
            {
                "name": "Igor Khazanov",
                "email": "igor.khazanov@uah.edu"
            }
        ],
        "model":
            {
                "short_name": "MAG4_LOS_FE",
                "spase_id": "spase://CCMC/SimulationModel/MAG4/v20190127"
            },
        "issue_time": "2017-09-10T23:30Z",
        "mode": "forecast",
        "forecasts": [
            {
```

```
        "energy_channel": {
                "min": 10,
                "max": -1,
                "units": "MeV"
        },
        "species": "proton",
        "location": "earth",
        "prediction_window": {
                "start_time": "2017-09-11T00:00Z",
                "end_time": "2017-09-11T23:59Z"
        },
        "probabilities": [
                {
                        "probability_value": 0.85,
                        "uncertainty": 0.08,
                        "threshold": 10,
                        "threshold_units": "pfu"
                },
                {
                        "probability_value": 0.22,
                        "threshold": 100.0,
                        "threshold_units": "pfu"
                }
        ],
        "all_clear": {
                "all_clear_boolean": false,
                "threshold": 10.0,
                "threshold_units": "pfu",
                "probability_threshold": 0.3
        }
},
{
        "energy_channel": {
                "min": 100,
                "max": -1,
                "units": "MeV"
        },
        "species": "proton",
        "location": "earth",
        "prediction_window": {
                "start_time": "2017-09-11T00:00Z",
                "end_time": "2017-09-11T23:59Z"
        },
        "probabilities": [
```

```
                        {
                                "probability_value": 0.01,
                                "threshold": 1,
                                "threshold_units": "pfu"
                        }
                ],
                "all_clear": {
                        "all_clear_boolean": true,
                        "threshold": 1.0,
                        "threshold_units": "pfu",
                        "probability_threshold": 0.2
                }
        }
    ]
  }
}
```


Example 5's JSON Output


```
{ "sep_forecast_submission": {
    "contacts": [
        {
            "name": "Model Developer Name1",
            "email": "developer1@email.com"
        }
    ],
    "model": {
        "short_name": "MODEL ACRONYM",
        "spase_id": "spase://CCMC/SimulationModel/MODEL_NAME1/VERSION"
    },
    "issue_time": "2017-09-10T20:00Z",
    "mode": "forecast",
    "triggers": [
        {
            "cme": {
                "start_time": "2017-09-10T16:06Z",
                "lat": -9,
                "lon": 108,
                "pa": 261,
                "half_width": 70,
                "speed": 2500,
                "height": 21.5,
                "time_at_height": {
                    "time": "2017-09-10T17:15Z",
```

```
                        "height": 21.5
                    },
                    "coordinates": "HEEQ",
                    "catalog": "DONKI",
                    "urls": [
                        "https://kauai.ccmc.gsfc.nasa.gov/DONKI/view/CME/13107/4"
                    ]
                }
            },
            {
                "cme_simulation": {
                    "model": "WSA-ENLIL+Cone",
                    "simulation_completion_time": "2017-09-11T09:42Z",
                    "urls": [
                        "https://kauai.ccmc.gsfc.nasa.gov/DONKI/view/WSA-ENLIL/13114/1"
                    ]
                }
            }
    ],
    "forecasts": [
            {
                "energy_channel": {
                    "min": 10,
                    "max": -1,
                    "units": "MeV"
                },
                "species": "proton",
                "location": "earth",
                "prediction_window": {
                    "start_time": "2017-09-10T17:15Z",
                        "end_time": "2017-09-17T00:00Z"
                },
                "peak_intensity": {
                    "intensity": 1000.0,
                    "units": "pfu",
                    "time": "2017-09-11T00:00Z"
                },
                "peak_intensity_esp": {
                    "intensity": 100,
                    "units": "pfu"
                },
                "event_lengths": [
                    {
                        "start_time": "2017-09-10T22:00Z",
```

```
                "end_time": "2017-09-13T00:00Z",
                "threshold": 1.0,
                "threshold_units": "pfu"
            }
        ],
        "threshold_crossings": [
            {
                "crossing_time": "2017-09-10T22:00Z",
                "threshold": 10.0,
                "threshold_units": "pfu"
            }
        ],
        "all_clear": {
            "all_clear_boolean": false,
            "threshold": 10.0,
            "threshold_units": "pfu"
        },
        "sep_profile": "samplesepprofile10MeV.txt"
},
{
        "energy_channel": {
            "min": 100,
            "max": -1,
            "units": "MeV"
        },
        "species": "proton",
        "location": "earth",
        "prediction_window": {
            "start_time": "2017-09-10T19:30Z",
            "end_time": "2017-09-17T22:30Z"
        },
        "peak_intensity": {
            "intensity": 10.0,
            "units": "pfu",
            "time": "2017-09-11T01:00Z"
        },
        "event_lengths": [
            {
                "start_time": "2017-09-10T22:00Z",
                "end_time": "2017-09-12T00:00Z",
                "threshold": 0.3,
                "threshold_units": "pfu"
            },
            {
```

```
                        "start_time": "2017-09-10T23:00Z",
                        "end_time": "2017-09-12T00:00Z",
                        "threshold": 0.5,
                        "threshold_units": "pfu"
                    }

                ],
                "threshold_crossings": [
                    {
                        "crossing_time": "2017-09-10T22:00Z",
                        "threshold": 1.0,
                        "threshold_units": "pfu"
                    }
                ],
                "all_clear": {
                    "all_clear_boolean": false,
                    "threshold": 1.0,
                    "threshold_units": "pfu"
                },
                "sep_profile": "samplesepprofile100MeV.txt"
            }
        ]
}
}
```