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CERES Release 2 IES and SSF

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Purpose:

The purpose of this bulletin is to clarify the content and order of the IES and SSF data products. In a meeting on November 26, 1996, a final Release 2 decision was reached. The IES will contain all the data taken during the hour, regardless of along-track angle. Stated another way, the IES data boundary cutoff will be time, not along-track angle. Therefore, an SSF will also contain only data taken during the associated hour. However, the SSF data will remain sorted by along-track angle.

Introduction:

On the last page of this bulletin is a figure which illustrates the points in this introduction. Footprint and Field of View (FOV) refer to one CERES data sample and may be used interchangeably.

We discussed two ways of grouping data into IES files, which in turn define how the data is grouped into SSF files. The first method, which will not be used, is based on along-track angle file boundaries. Let t_0 be the start of the hour and t_1 the end of the hour. Let the rectangle in the figure represent a data swath, and assume the data is from a Rotating Azimuth Plane Scan (RAPS) mode. The two solid circles represent the satellite at the beginning, time t_0, and end, time t_1, of the hour. At time t_0, the associated along-track angle is 0.0 degrees by definition. At time t_1 the associated along-track angle on the figure is 211.0 degrees. Let us refer to this along-track angle generically as Max_Along_Track. The Max_Along_Track angle will vary between satellites. The value 211.0 degrees is used for illustrative purposes only. If one uses along-track angle file boundaries, then all the footprints with along-track angles between 0.0 and Max_Along_Track would be placed in the hourly file regardless of the footprint sampling time. Therefore, although the two footprints at times $t_0 + \Delta t$ and $t_1 - \Delta t$ in the figure were taken within the hour, their associated along-track angles do not fall within the along-track range. They would be placed in the previous hour and next hour respectively. Similarly, there would be footprints which were sampled before time t_0 or after time t_1 that have along-track angles between 0.0 and Max_Along_Track. These footprints would be saved as part of this hour.

The second method, which will be used, is based on time boundaries. In this case, the data sampled between the start and the end of the hour would be saved in the hourly file. Referring to the figure, the footprints recorded between times t_0 and t_1, including the footprints at times $t_0 + \Delta t$ and $t_1 - \Delta t$, would be saved as part of the hour. Similarly, any footprints whose along-track angle falls within the range of 0.0 to Max_Along_Track but which were sampled before t_0 or after t_1

would be saved as part of the previous or next hour respectively.

Neither of these methods of grouping the footprints into files by establishing along-track angle or time-based boundaries make any claims about the ordering of the footprints within the hourly files.

Discussion:

The IES and SSF will both contain the data taken during the hour, regardless of along-track angle. The IES will be ordered by time. The SSF will be ordered by along-track angle.

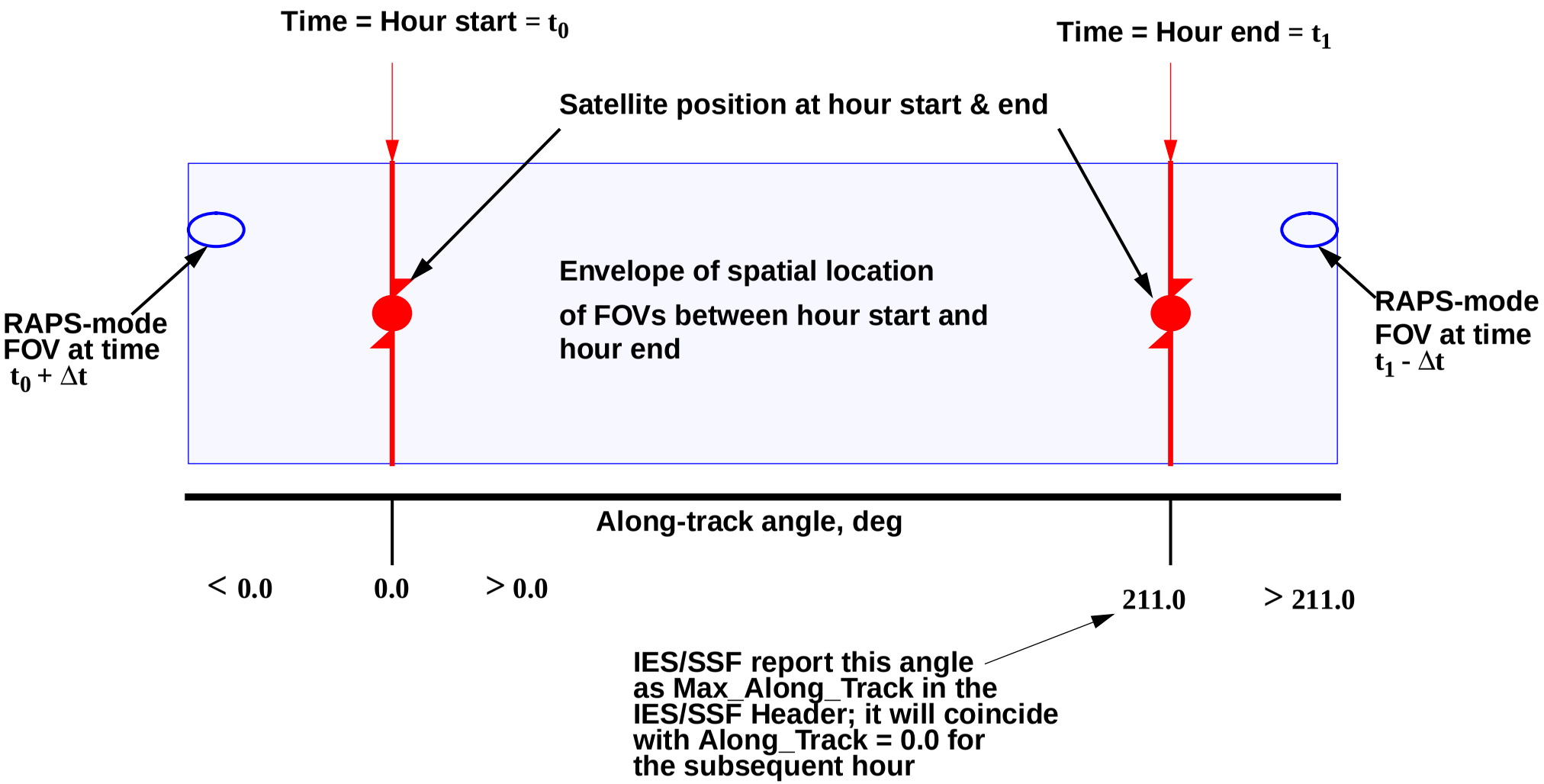
The main motivation in making this decision was the end-user. When a data product is defined as hourly, most people expect it to contain data taken during that hour. However, the data need not be time ordered, as long as the data product description clearly states the ordering. Other factors were also considered.

It is easier for the IES to be sorted by time with a secondary index that allows the data to be read in along-track order. It is more difficult to implement and takes longer to execute software to store the footprints in along-track order. Since the IES will be stored at the DAAC for very long periods of time, it is best to avoid storing overlapping data in both hourly IES files. Even if the IES hour boundaries were based on along-track angle, the first and last hour of a day would always be exceptions to the rule due to processing constraints. Therefore, the logic to handle files with along-track angles less than 0.0 and greater than the Max_Along_Track must exist in either case.

Regardless of which data boundary is used for the IES, the intermediate cookie dough product must contain some additional data from the previous hour and next hour of imager data so that all possible IES footprints have complete cookiedough coverage. This is referred to as a “fat” cookiedough. If the IES boundary is based on along-track angle, the cookiedough need not be quite as “fat” as when the IES boundary is based on time. However, if the IES boundary is angle-based, the “fat” cookiedough would have to be adjusted at the day boundaries. The “fat” cookiedough requirements for time-based IES boundaries are uniform for all hours.

Finally, the main advantage to having along-track angle based boundaries for SSF files is that radiance pairs, used to create and validate Angular Distribution Models (ADMs), would exist within the same file. However, one can still locate the pairs if they are split between two files and the activity of finding radiance pairs, although lengthy, will end once the ADMs are generated and validated.

In conclusion, the IES and SSF will have time-based boundaries. Most end-users are probably expecting an hourly SSF to contain footprints taken during that hour. All IES and SSF files can be treated without exceptions, and all known activities can be accomplished given time-based IES and SSF boundaries. However, the footprints in the SSF will remain spatially ordered by along_track angle. Therefore, footprints at the beginning of an SSF may have negative along-track angles, and footprints at the end of the SSF may have along-track angles which exceed the Max_Along_Track angle.


Time = Hour start = t_0
Time = Hour end = t_1
Satellite position at hour start & end
Envelope of spatial location
of FOVs between hour start and
hour end
RAPS-mode
FOV at time
$t_0 + \Delta t$
RAPS-mode
FOV at time
$t_1 - \Delta t$
Along-track angle, deg
< 0.0
0.0
> 0.0
211.0
> 211.0
IES/SSF report this angle
as Max_Along_Track in the
IES/SSF Header; it will coincide
with Along_Track = 0.0 for
the subsequent hour