

3.1 CATCH: Subcatchments Precipitation Accumulation

3.1.1 Overview

The CATCH product calculates the precipitation accumulation in subcatchment regions such as a watershed areas. It is used for hydrometeorological applications such as estimating the total rainfall in a river basin for the purpose of flood forecasting. Both the time of the integration and the subcatchment areas can be selected. The CATCH product can also issue warnings if the precipitation in a subcatchment region exceeds a threshold value.

Like the RAINN product, CATCH is a product of a product for which the hourly RAIN1 product serves as the input. You can sum any number of hours of individual RAIN1 products. The only limitation is the number of RAIN1 products stored on disk. As part of the IRIS Hydromet Option, the RAIN1 products can be calibrated by means of raingage input, thus CATCH products also get the benefit of this calibration. See **Appendix F** for a description of IRIS Hydromet raingage calibration.

The subcatchment areas are defined in a manner similar to overlays, i.e., subcatchment regions are defined by using LAT/LON vector points and stored in a file in the IRIS_OVERLAY directory. A “catch” file will typically contain many subcatchment areas. There can be more than one catch file so that users can have different “mixes” of subcatchments.

The output of the CATCH product is a file that contains the precipitation depth for each subcatchment for each hour and the total over the selected integration time. This file can be displayed by itself or overlaid on another product display. There is an interactive pop-up bar graph display that shows the hourly precipitation amounts in each subcatchment.

In this section is described:

- | | |
|---------------------------------------|----------------------|
| • Configuration of the CATCH product. | Section 3.1.2 |
| • Subcatchment definition | Section 3.1.3 |
| • Scheduling of the CATCH product | Section 3.1.4 |
| • The product algorithm | Section 3.1.5 |
| • Display | Section 3.1.6 |

3.1.2 CATCH Product Configuration

To open the CATCH Product Configuration menu:

From the Product Configuration menu choose **Type->CATCH** from the menu bar.
The fields are described below.



The CATCH product requires that the Hydromet Option be purchased. If the CATCH product does not appear in the Product Scheduler or in the list of available product types in the Product Configuration Menu, then you do not have a license for the CATCH product.

SIGMET, HOT CATCH Product Configuration: 03_HOUR

File Menus Type Commands Help

TASK SUMMARY

TASK Name DSP Data
 Scan Mode Max Range
 Angle List El:4 angles from 0.0 to 10.0

PRODUCT PARAMETERS

Rain1
 Hours
 Subcatch
 Issue Warn ☒
 Offset
 Multiplier

DISPLAY PARAMETERS

Display Units
 Color Scale
 Levels
 1st Level/Step
 Resolution

Rain1

In the Rain1 field, specify the product name of the input hourly RAIN1 product. You can click on the Rain1 button and choose from a list of products, or enter the name directly into the field.

When you enter a product name, the associated TASK information is displayed in the TASK Summary portion of the menu.

Hours

Specify the number of hours to integrate. When the product runs, it integrates data for the last N hours. If a RAIN1 product is missing for one of the hours in the interval, the algorithm assumes that no rain fell during that hour. The product output shows how many hours were actually integrated.

Color Scale, Levels, and 1st Level/Step

The color levels can be specified, but the resolution is fixed by the resolution of the RAIN1 configuration.

Subcatch

Select the subcatchment file name. The subcatchment file contains the definitions of the various subcatchments. See **Section 3.1.3** for more information.

Issue Warn

The CATCH product can generate warnings if the amount of precipitation for a subcatchment exceeds a threshold value. The threshold value for each subcatchment area is configured in the subcatchment file. See **Section 3.1.3** for more information.

Offset and Multiplier

These are used to modify the thresholds that are set for each subcatchment. This might be done to account for different integration times. For no adjustment of the thresholds in the subcatchment file set Offset=0.0 and Multiplier=1.0.

It is recommended that users configure their thresholds in the subcatchment file to be characteristic of accumulation over a standard time such as one hour. The offset and multiplier can then be set to adjust all of the thresholds.

For example suppose that as an indicator of flood hazard in a subcatchment experience shows that the one hour threshold is 10 mm and the two hour threshold is 15 mm for flood hazard. The 10 mm value can be configured for the subcatchment and then the multiplier can be set to 1.5 and the offset set to 0.0. This allows some degree of adjustment of the subcatchment thresholds for different time periods.

Another technique is to configure different subcatchment files with the thresholds set for different integration times. In this case the name of the subcatchment file should reflect the integration time such as CATCH_06 to indicate that the thresholds are set for 6 hours.

Save As: Naming CATCH products

Similar to RAINN products, it is recommended to name your catch product by the number of hours of integration and a general descriptor of the area, perhaps even the name of the subcatchment file. For example, if the subcatchment file for a large river watershed is called RED_RIV and the integration time is two hours, save the product under the name "RED_RIV_02".

3.1.3 Subcatchment Definition

Subcatchment areas are defined in a file that is stored in the `IRIS_OVERLAY` directory (typically `/usr/sigmet/config/overlay`). These are given the special suffix `“.cat”` and referred to as “catch” files. When IRIS is started via the `siris` command or from IRISnet, the start-up log shows the processing of the catch files.

The detailed data format for the catch files is described in the *IRIS Utilities Manual* section on the **overlay** utility. In general the files contain the following information for each subcatchment:

- Subcatchment index number (an integer 1, 2, 3, ...) and name. The name is used for display.
- The threshold in mm of accumulation depth for the warning.
- The subcatchment points in LAT/LON coordinates. These points must define a closed region and be in sequence about the perimeter of the region, i.e., the first point and the last point will always be the same. Subcatchments that share the same boundary must be entered as complete closed regions, i.e., the shared boundary points are the same for adjacent subcatchments.
- The location of an internal point for the labeling. This point must be within the bounded region of the catchment.

Each catch file will generally have many subcatchment regions. There can be multiple subcatchment files for different applications such as:

- For different radars in a network.
- To specify different warning thresholds to account for different integration times.
- To cover different major watershed areas.

It is also allowed to have overlapping subcatchments in a file. For example, a large watershed region could be input as a single large catchment and the smaller tributary watersheds within it be specified as well. IRIS allows a maximum of 20 different catch files to be created.

3.1.4 Scheduling CATCH Products

The scheduling of CATCH products is identical to the scheduling of RAINN products. See **Section 2.10** for a discussion of the RAINN scheduling algorithm. If the RAIN1 input is corrected by means of raingage input data, then there will be a delay in the CATCH product since the input RAIN1 product is delayed as it waits for the arrival of the raingage data.

In the Product Scheduler, the Data Time field refers to the end of the period for which you are integrating. The Skip Time field can be used if you want only the accumulations for specific time intervals. For example, if you want a 3-hour integration only for the periods ending at 03:00, 06:00, 09:00, ..., set the Skip Time field to 03:00.

3.1.5 CATCH Product Algorithm

The CATCH product algorithm takes the RAIN1 products for the specified integration time (Hours) and then performs the following steps:

- For each subcatchment, all pixels in the RAIN1 product that are within or touching the subcatchment perimeter are added together and then divided by the total number of pixels. Thresholded pixels are treated as zero rainfall. The result is the average hourly rainfall for the subcatchment.
- This is repeated for each hour and each subcatchment.

After this is done, the following computations are performed:

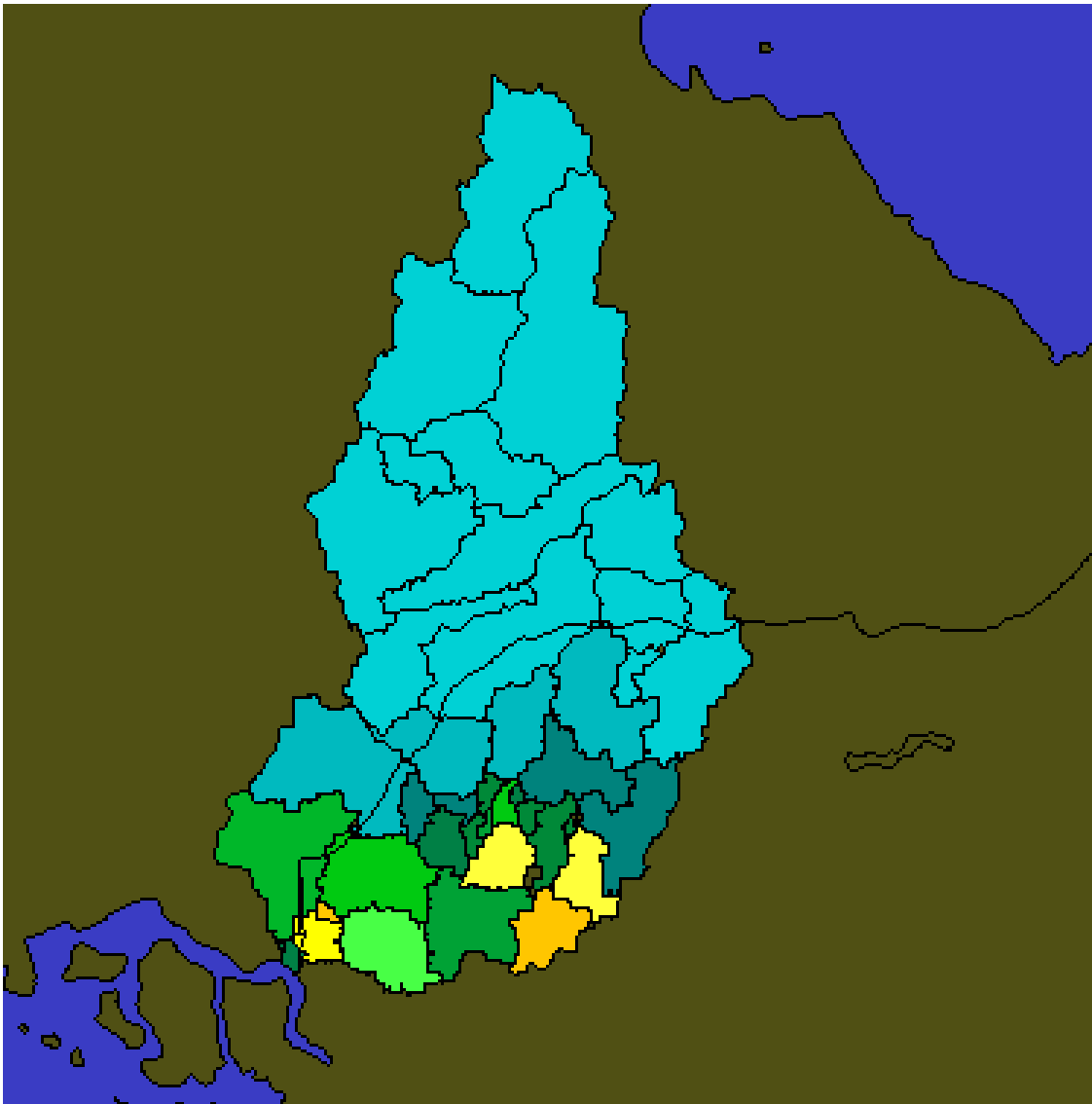
- The sum over all hours in the integration time is taken for each subcatchment to get a total average accumulation for the time period.
- If the “Issue Warn” button is clicked—on, this sum is checked against the catch file warning threshold (adjusted by the “Offset” and “Multiplier”) and a single IRIS warning is issued for all subcatchment areas that exceed the threshold.

The final output file contains for each subcatchment:

- The LAT/LON of the label point, the point name and index number.
- The hourly average accumulations over the selected integration time. These are used for the pop-up bar graph display.
- The total average accumulation for the integration time.
- The fraction of pixels in the subcatchment that had non-zero precipitation.

The output file does not contain the subcatchment boundary definitions. This has implications for display when the CATCH product is transferred to another machine. See the next section for a discussion of this.

3.1.6 Product Display



The Quick Look Window display for the CATCH product shows either:

- Color coded subcatchment map regions where the color code shows the precipitation depth (see example above). The color scale is the rainfall depth scale in mm or inches. These color scales and the units are configured in the **color_setup** utility (see the *IRIS Utilities Manual*)
- Colored icons where the icon (a raingage bucket shape) is drawn in the color code for the precipitation depth. This display style is used when the CATCH product is overlaid on another product.

The choice of display style is made in the “Options” button at the top of the Quick Look Window. You must first display a CATCH product to activate this button.

In either case, clicking the right mouse button on a subcatchment causes bar graph to pop-up. This shows the hourly precipitation accumulation for the integration time. The bar graph vertical scale can be selected by pressing the up and down triangles next to the top of the scale.

