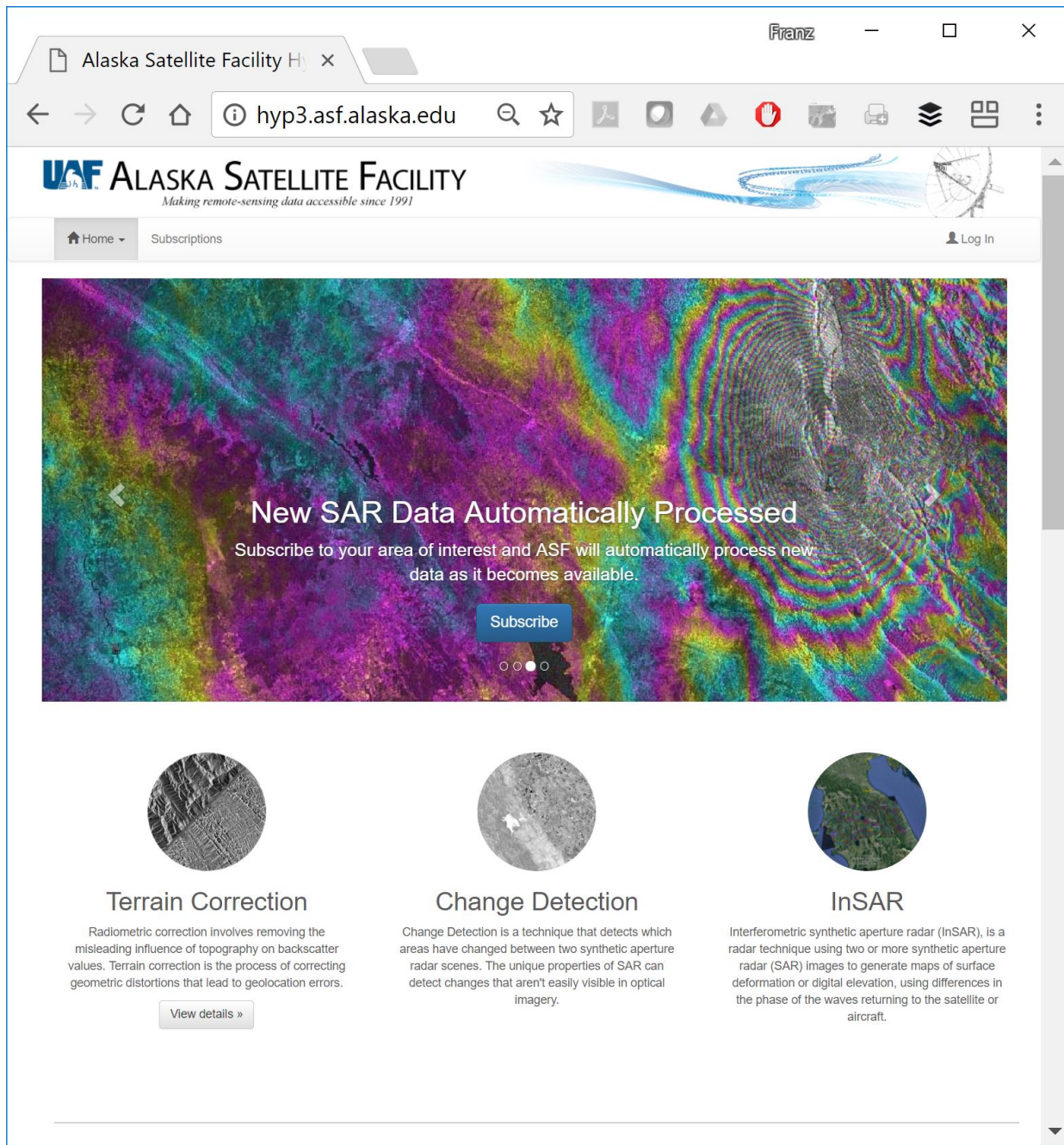


# Automatic Generation of Fully Geocoded and RTC Processed Sentinel-1 SAR Data Using the ASF HyP3 Service

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Alaska Satellite Facility H x

hyp3.asf.alaska.edu

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Home Subscriptions Log In

**New SAR Data Automatically Processed**

Subscribe to your area of interest and ASF will automatically process new data as it becomes available.

Subscribe

**Terrain Correction**

Radiometric correction involves removing the misleading influence of topography on backscatter values. Terrain correction is the process of correcting geometric distortions that lead to geolocation errors.

[View details »](#)

**Change Detection**

Change Detection is a technique that detects which areas have changed between two synthetic aperture radar scenes. The unique properties of SAR can detect changes that aren't easily visible in optical imagery.

**InSAR**

Interferometric synthetic aperture radar (InSAR), is a radar technique using two or more synthetic aperture radar (SAR) images to generate maps of surface deformation or digital elevation, using differences in the phase of the waves returning to the satellite or aircraft.

<http://hyp3.asf.alaska.edu/>

## A Few Words About HyP3

The Hybrid Pluggable Processing Pipeline, or HyP3 (pronounced "hype"), is an effort to provide custom on-demand SAR processing for users. The HyP3 service is completely free to use and provides a limited amount of processing for a user per month. Currently, the HyP3 system is in beta and while access is limited, you have all be approved to use HyP3 services to start exploring SAR for your work.

Currently we provide a number of different implementations of Interferometric SAR (InSAR), Radiometric Terrain Correction (RTC), and Change Detection algorithms. You will be mostly interested in ordering GAMMA-processed RTC products, fully geocoded and radiometrically terrain corrected images ready for use in GIS. Through HyP3, these RTC products will be provided to you automatically and free of charge for a user-defined area of interest. Citation information for the GAMMA RTC algorithm is provided below. If you wish to cite the HyP3 system itself, please use the following citation information:

*Hogenson, K., Arko, S.A., Buechler, B., Hogenson, R., Herrmann, J. and Geiger, A., 2016. Hybrid Pluggable Processing Pipeline (HyP3): A cloud-based infrastructure for generic processing of SAR data. Abstract [IN21B-1740] presented at 2016 AGU Fall Meeting, San Francisco, CA, 12-16 December.*

## The HyP3 GAMMA RTC Algorithm

The GAMMA radiometric terrain correction algorithm uses the GAMMA software to create GIS-ready, geometrically and radiometrically corrected SAR imagery products for you fully automatically for every frame touching a pre-defined area of interest. The procedure uses a Digital Elevation Model (DEM) covering the SAR imagery to create a simulated radar image. This simulated image is then matched with the real SAR image to create a precise mapping from SAR space into DEM space (in this case, UTM projection). This mapping is then used to move all SAR pixels into a geocoded product. After remapping, a radiometric correction is applied using the pixel-area integration approach (Small 2011). Finally, the resulting RTC image along with ancillary products are converted to geotiffs, jpgs, and kmzs for ease of use to the end user.

**GAMMA Software website:** <https://www.gamma-rs.ch>

**Algoritihm Theoretical Basis Document for ALOS:**

[https://media.asf.alaska.edu/uploads/RTC/rtc\\_atbd\\_v1.2\\_final.pdf](https://media.asf.alaska.edu/uploads/RTC/rtc_atbd_v1.2_final.pdf)

(Note: this covers ALOS, but the same science principles apply for Sentinel)

Citation: Small, D., 2011. Flattening gamma: Radiometric terrain correction for SAR imagery. IEEE Transactions of Geoscience and Remote Sensing, 49(8):3081-3093.

More information on HyP3 and its processing algorithms can be found here:

<http://hyp3.asf.alaska.edu/about>

## How to Log In to HyP3

To generate RTC products over your area of interest automatically you can use the ASF HyP3 service.

The HyP3 services is available <http://hyp3.asf.alaska.edu>. The login for HyP3 is identical to the login you

have created for the ASF Vertex Search Client (<https://vertex.daac.asf.alaska.edu/>). As access to HyP3 is limited, you will not be activated automatically after your first login. To get activated do the following:

1. Login to HyP3 by clicking the login button on the top right of the interface (see figure below) and type in your username and password that you already created for ASF Vertex.

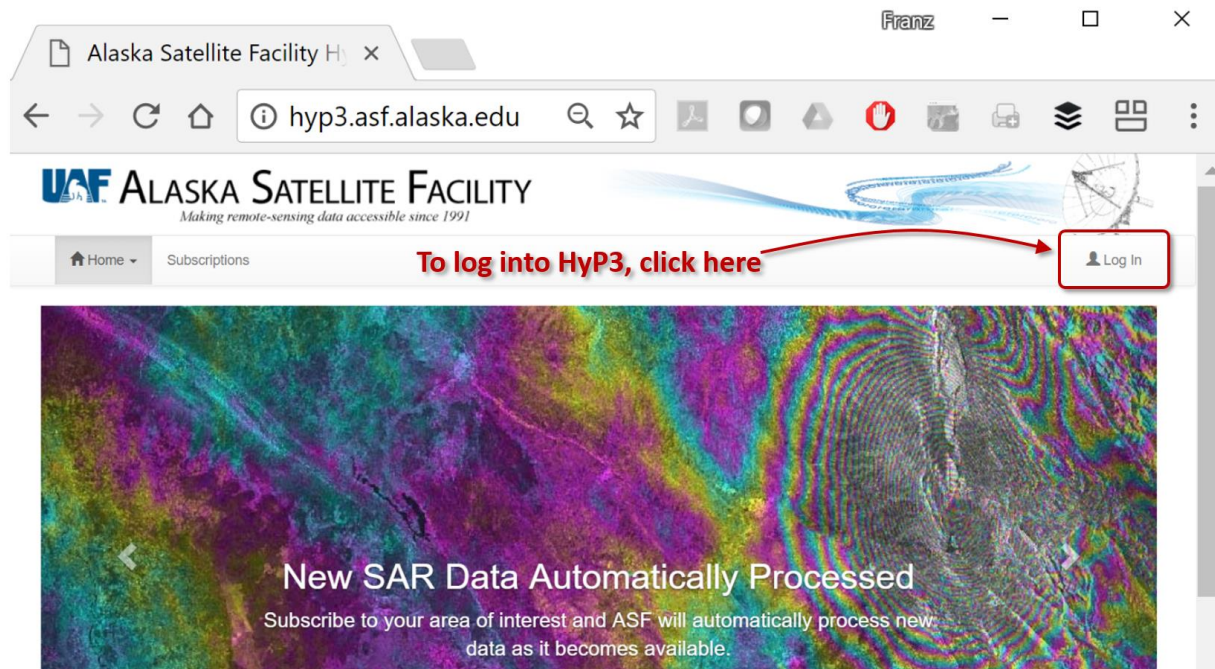


Figure 1: HyP3 Landing page with location of the login button.

2. Once you've logged in for the first time, send me an email with your name and your username to [fjmeyer@alaska.edu](mailto:fjmeyer@alaska.edu) and I will make sure that you will be activated on the system.
3. Once you are activated, you are approved for use.

## How to Create a HyP3 Subscription For Your Area Of Interest

There are two main ways how to do processing in HyP3. The possibly more interesting of these options is the **Subscription** mode, where HyP3 will automatically process every newly acquired Sentinel-1 SAR image that hits your area of interest to a product of your choice (e.g., fully geocoded RTC product). This is convenient because, once set up, you will automatically get new data sent to you every time Sentinel-1 sees your region of interest. No further interactions are needed.

Figure 2 (next page) shows what the HyP3 subscription interface looks like. On the landing page, it shows you your existing subscriptions (this area will be empty when you come in for the first time).

To create a new subscription please click the "New Subscription" button on the bottom of the page.

Once you clicked on "New Subscription" button you will see the web page shown in Figure 3. Using this interface, you can create a subscription to automatically receive fully processed RTC images over an area of interest. Instructions how to create a new subscription are provided in Figure 3.

**A note on using the HyP3 subscription service:** Please don't make your area of interest too large. This is a free service and we only can sustain the free-of-charge nature of this service if users are mindful of the number of images they are requesting to be processed.

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Home Subscriptions One-Time Processing Products

**Current Subscriptions**

Show 10 entries | Show Active Subscriptions Search:

Name	Description	Process	Start Date	End Date	Enabled	Active	Controls
Bogoslof RGB		RGB Decomposition	2016/11/01		True	Yes	Edit Disable
FDL InSAR	None	InSAR - GAMMA	2016/10/15		True	Yes	Edit Disable
Monitoring Pavlof Eruption	None	RTC - GAMMA	2016/07/18		True	Yes	Edit Disable
Nevado del Ruiz InSAR	None	InSAR - GAMMA	2017/04/01		True	Yes	Edit Disable
Okmok InSAR		InSAR - GAMMA	2016/09/01		True	Yes	Edit Disable
Red Dog Mine InSAR	None	InSAR - GAMMA	2017/04/15		True	Yes	Edit Disable
Selawik Fire 2017	None	Change Detection - Threshold			True	Yes	Edit Disable
Tair Island InSAR		InSAR - GAMMA	2016/10/15		True	Yes	Edit Disable

Showing 1 to 8 of 8 entries (filtered from 22 total entries) Previous 1 Next

**New Subscription**

**This is where you create a new HyP3 subscription**

Figure 2: HyP3 Subscription Service Landing Page.



- Once logged in, click on the **Subscription Tab**
- Provide a name for the subscription
- Select product type – most relevant for you:
  - RTC GAMMA processing
  - RGB Decomposition Images
  - InSAR GAMMA
- Select your area of interest
- Select a start (and end) date
- Click “Submit” and you are done

The screenshot shows the 'Create Subscription' form on the UAF Alaska Satellite Facility website. The form has a header with the UAF logo and navigation tabs: Home, Subscriptions, One-Time Processing, and Products. The 'Subscriptions' tab is active. The form fields include:
 

- Name:** A text input field.
- Enabled:** A checkbox that is checked.
- Process:** A dropdown menu.
- Location:** A map of Alaska with a dashed box indicating the area of interest.
- Start date:** A text input field with a calendar icon.
- End date:** A text input field with a calendar icon.
- Description:** A text area.
- Submit:** A blue button at the bottom right.

Figure 3: How to create a new subscription.

## One-Time Processing Option

In addition to the subscription service, which automatically processes newly acquired images over an area of interest, there is also a “**One-Time Processing**” option in HyP3. This processing mode processes a very specific set of images rather than automatically processing all scenes over an area of interest. To use this option, the images to be processed need to be known beforehand. Figure 4 shows the interface of the one-time processing interface and explains how to use this processing method.

- Click on the **One-Time Processing Tab**
- **Select product type** – most relevant for you:
  - RTC GAMMA processing
  - RGB Decomposition Images
  - InSAR GAMMA
- **Provide a list of granules (images) you want to process**
- Click “Submit”

The screenshot shows the 'One-Time Processing' interface on the UAF Alaska Satellite Facility website. The interface has a header with the UAF logo and navigation tabs: Home, Subscriptions, One-Time Processing, and Products. The 'One-Time Processing' tab is active. The interface includes:
 

- Process:** A dropdown menu.
- Granule list field:** A large text area for pasting CSV formatted text.
- Granule list file:** A section with a 'Choose File' button and a note: 'No file chosen. You can submit a CSV file here, but leave the above text field blank if you do.'
- Submit:** A blue button at the bottom left.

Figure 4: The HyP3 One-Time Processing Interface.

## Email Notification Service

Whenever HyP3 has completed a new product, you will receive an email notification from the system. The layout and information content of the email is shown in Figure 5. The email will be sent to the email address that you've specified in your user account. The email contains a preview of your product as well as a download link.

- Download link to file

- Preview of the product

- Location of the original data

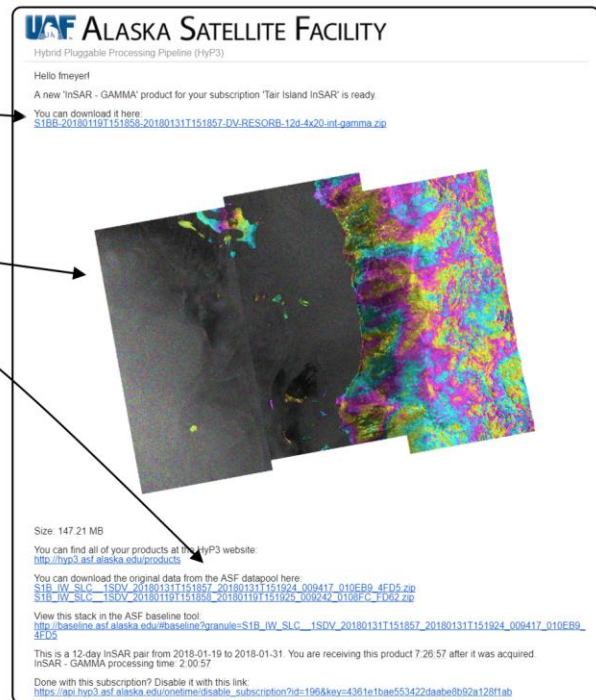


Figure 5: Layout and content of the emails that you will receive from HyP3.