From raw data to biodiversity indicators

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Galaxy PROJECT

DATA TERRA

PNDB
Pôle National de Données de Biodiversité

AGENDA

What are we talking about

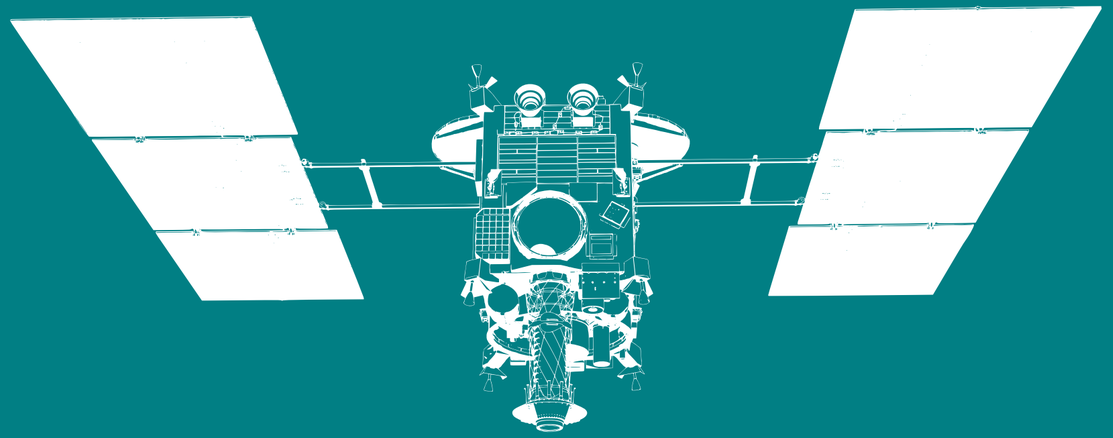
01

Remote sensing with Sentinel 2

02

Biodiversity data exploration an overview

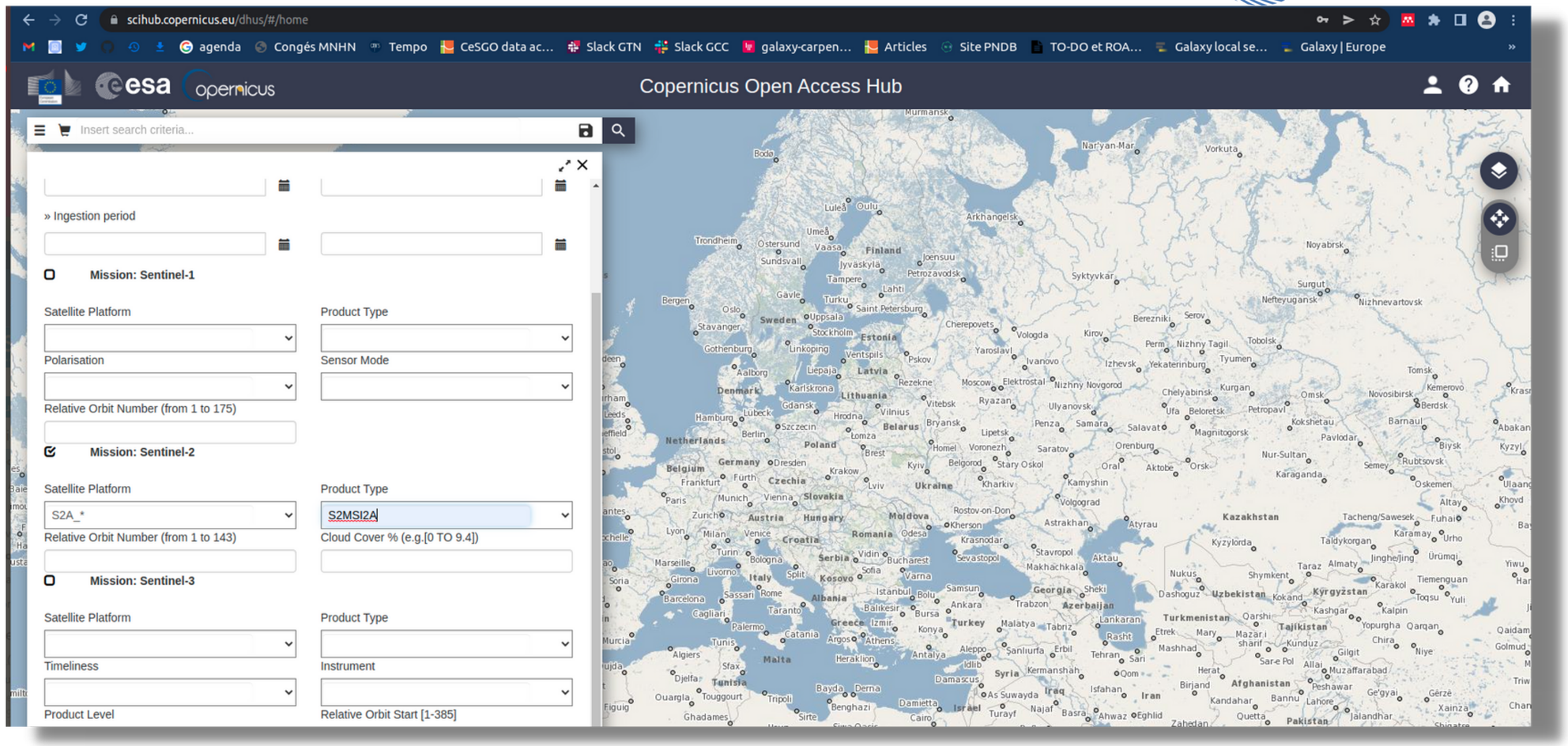
Context



- Remote sensing
- For biodiversity indicators
- What's the point ?

Download S2 data

Multiple platforms : Scihub, Peps and Theia



Preparing your data

Prepocess Sentinel 2

Upload your data

Scihub a zip folder

Prepare

The tool reads an give 2 files to use for your analysis

Raster Bil

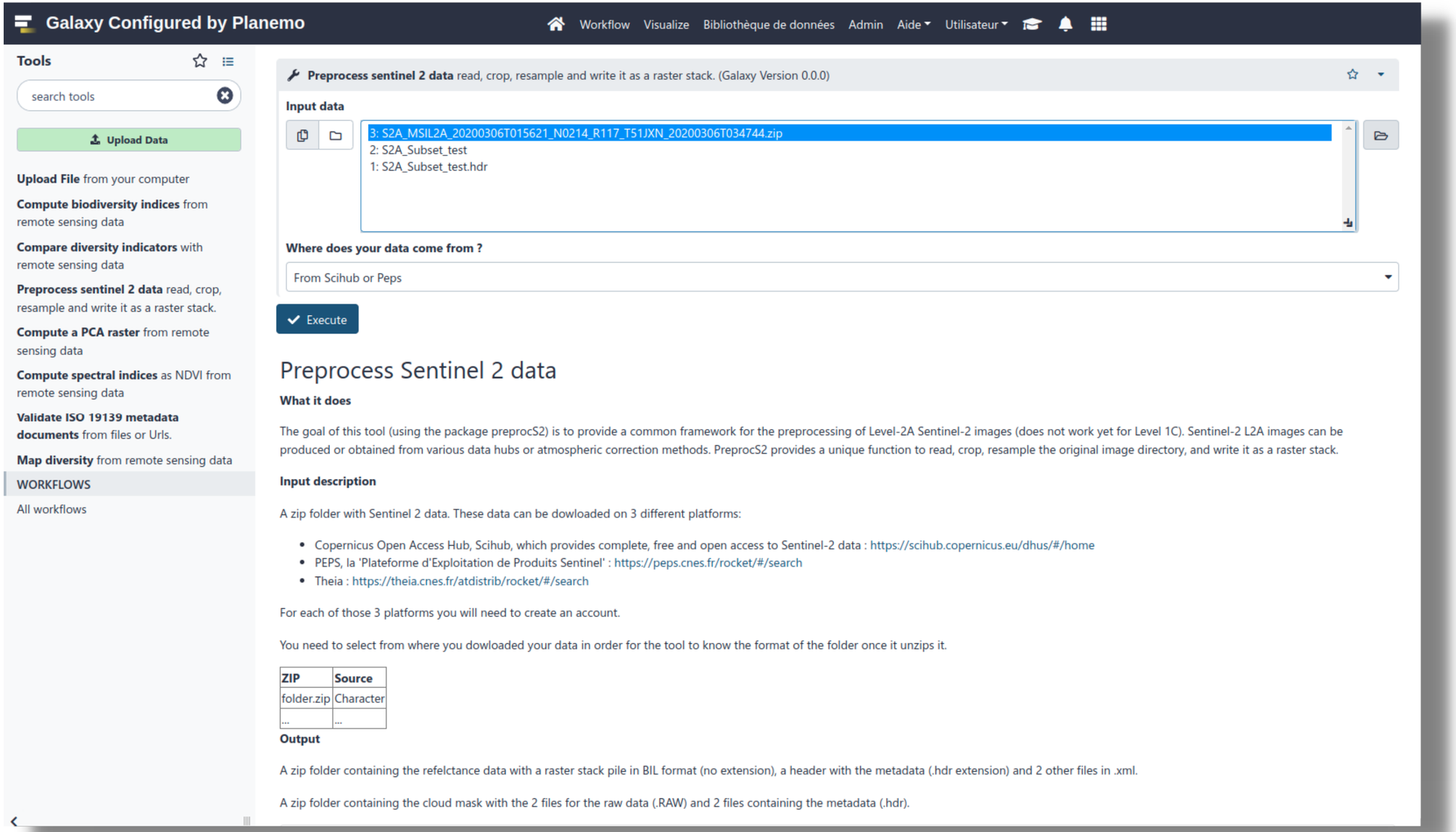
Image stored as a succession of pixels

Metadata

Description of the raster bil

Envi Bil Format

Quick overview of what the tool looks like



Rasterdiv

Compute biodiversity indicators

Global diversity overview to find the hot spot

S2A_Subset	longitude	latitude	Shannon	Renyi	Berger-Parker	Pielou	Hill	Prao	CRE
231	13.7119569929834	3.17838623784837	2.60890630597545	2.60890630597545	0.16	356880	13.5841857815757	5.1584	356880
231	13.7137566357487	3.17838849139271	2.69060859631006	2.69060859631006	0.133333333333333	357080	14.7406442928311	5.10888888888889	357080
228	13.7155562797955	3.17839074178832	2.67674384766503	2.67674384766503	0.142857142857143	357280	14.5376792458669	4.84571428571429	357280
231	13.7173559251221	3.1783929890352	2.67118246534123	2.67118246534123	0.125	357480	14.4570540550398	4.785	357480
219	13.7191555717267	3.17839523313333	2.7307675777817	2.7307675777817	0.111111111111111	357680	15.3446607213507	5.04691358024691	357680
223	13.7209552196075	3.1783974740827	2.78790610193132	2.78790610193132	0.111111111111111	357880	16.2469646722969	5.26024691358025	357880
230	13.7227548687627	3.17839971188331	2.86114692117586	2.86114692117586	0.111111111111111	358080	17.4815654206707	5.32543209876543	358080
233	13.7245545191906	3.17840194653513	2.87277465770396	2.87277465770396	0.111111111111111	358280	17.6860228423754	5.67703703703704	358280
240	13.7263541708893	3.17840417803817	2.86114692117586	2.86114692117586	0.111111111111111	358480	17.4815654206707	5.71654320987654	358480
229	13.7281538238571	3.1784064063924	2.85359585287384	2.85359585287384	0.111111111111111	358680	17.350058061542	5.83703703703704	358680
227	13.7299534780921	3.17840863159782	2.77434222019488	2.77434222019488	0.0888888888888889	358880	16.0280805797061	5.85679012345679	358880
224	13.7317531335926	3.17841085365442	2.77434222019488	2.77434222019488	0.0888888888888889	359080	16.0280805797061	5.92592592592593	359080
230	13.7335527903567	3.17841307256218	2.92837492698598	2.92837492698598	0.0888888888888889	359280	18.6972214448931	7.26716049382716	359280
234	13.7353524483827	3.17841528832109	2.98844975483482	2.98844975483482	0.111111111111111	359480	19.8548786913162	8.05333333333333	359480
236	13.7371521076688	3.17841750093115	2.99600082313684	2.99600082313684	0.111111111111111	359680	20.0053717129103	8.46617283950617	359680
229	13.7389517682132	3.17841971039234	3.02079455106064	3.02079455106064	0.0888888888888889	359880	20.5075795316409	9.17728395061728	359880
237	13.7407514300141	3.17842191670466	2.9692709500047	2.9692709500047	0.111111111111111	360080	19.4777141909957	8.14222222222222	360080
235	13.7425510930697	3.17842411986808	2.91520893559028	2.91520893559028	0.111111111111111	360280	18.4526674189673	7.52987654320988	360280

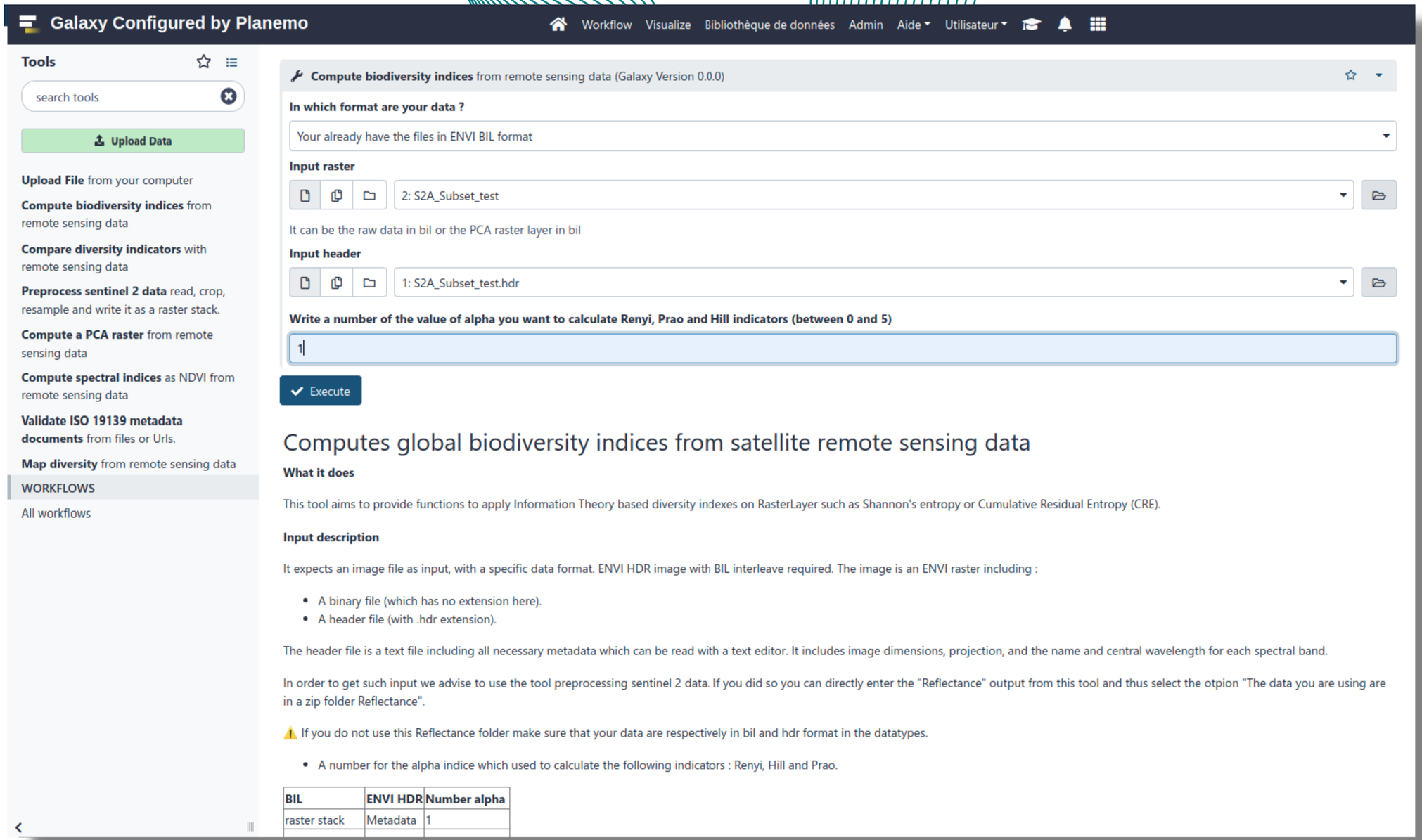
Input

The 2 envi bil files from the first tool

Output

Multiple biodiversity indicators shown in tabular and in graphs

How does it look like ?



BiodivMapR

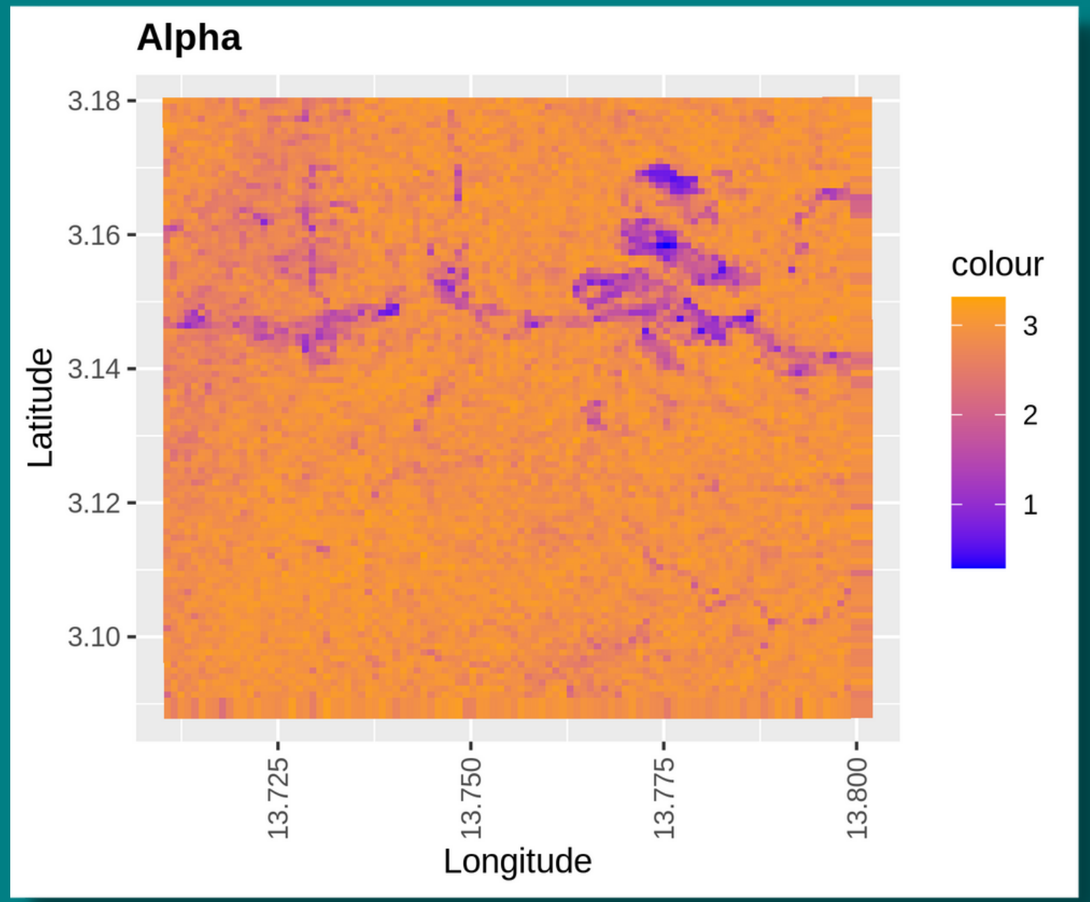
Canopy study :
Map diversity tool

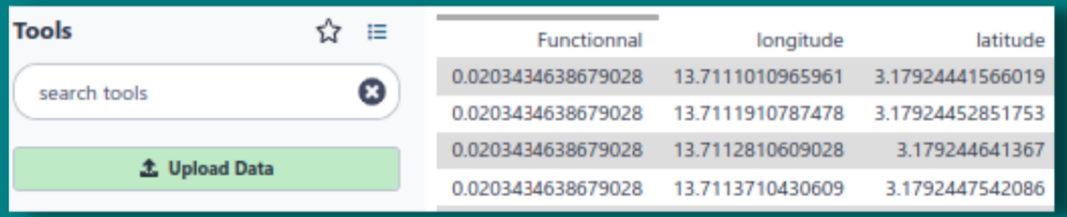
Input

- The 2 envi bil files from the previous tool

Output

- Alpha diversity
- Beta diversity
- Functionnal analysis



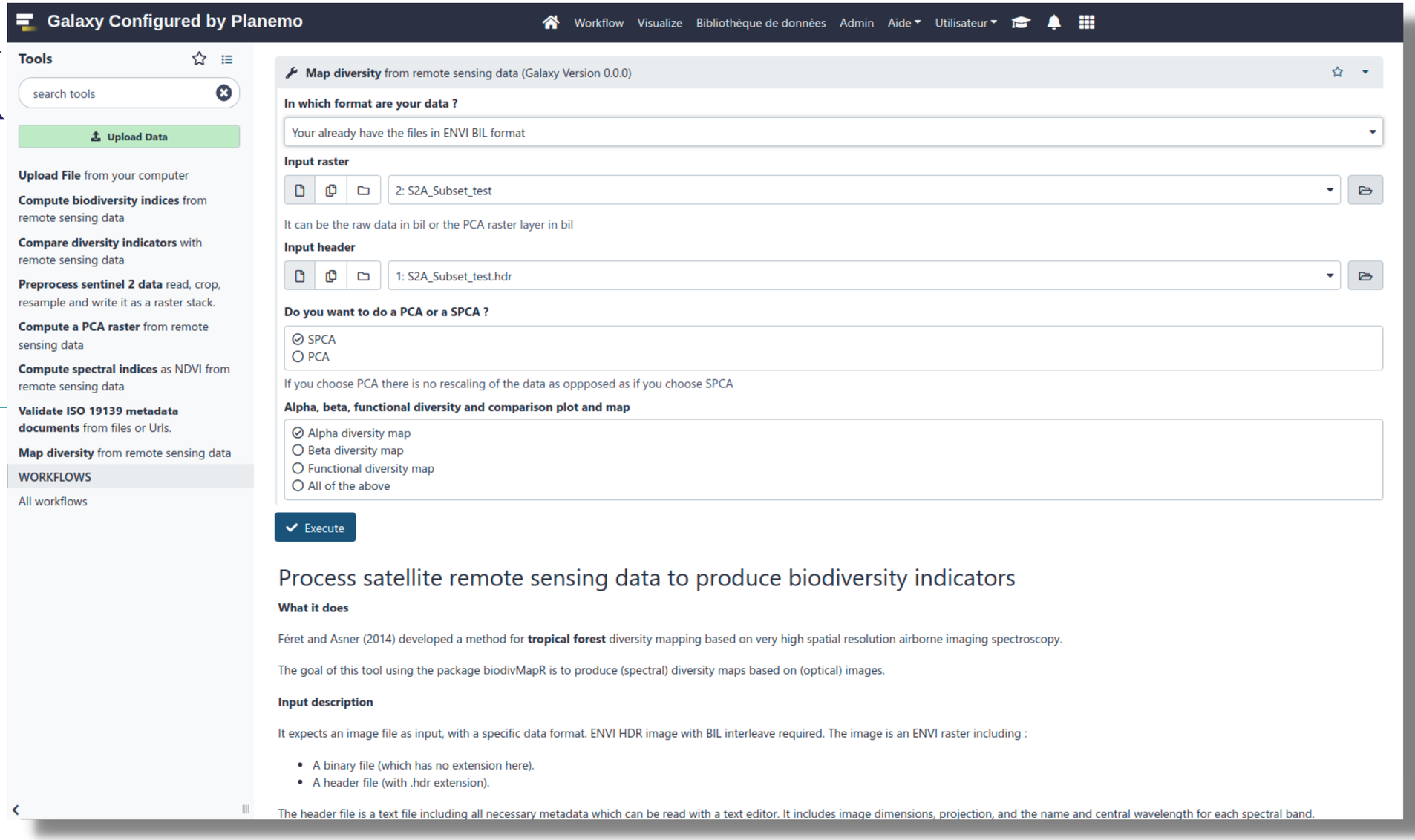


Functionnal	longitude	latitude
0.0203434638679028	13.7111010965961	3.17924441566019
0.0203434638679028	13.7111910787478	3.17924452851753
0.0203434638679028	13.7112810609028	3.179244641367
0.0203434638679028	13.7113710430609	3.1792447542086

Remote sensing with Sentinel 2

How does it look like ?

Map diversity



BiodivMapR

Canopy study : Comparison tool

Input

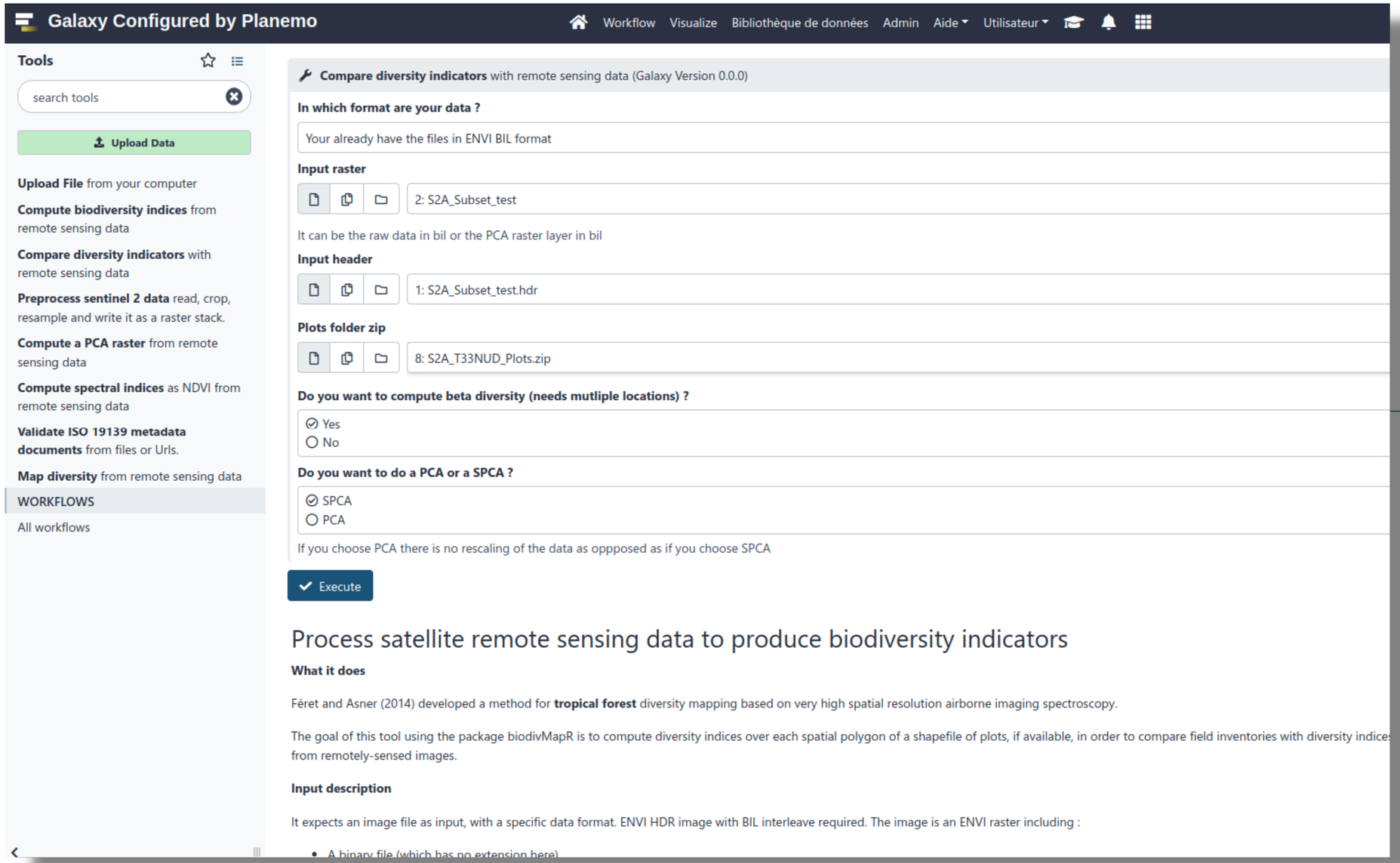
- The 2 envi bil files from the first tool
- if you want to compare with in situ data you'll also need a shape file

ID_Plot	Forest_HighDiversity	Forest_LowDiversity	Forest_MediumDiversity	LowVegetation	Forest_HighDiversity	Forest_LowDiversity
Forest_HighDiversity	0	0.592972288569817	0.565601439639129	0.641352656343501	0.553116089728383	0.723287828668831
Forest_LowDiversity	0.592972288569817	0	0.794954586282086	0.781355810742138	0.68534833660536	0.782484730632053
Forest_MediumDiversity	0.565601439639129	0.794954586282086	0	0.576192328969609	0.497822379593039	0.649394360809528
LowVegetation	0.641352656343501	0.781355810742138	0.576192328969609	0	0.523405001569518	0.557895945457021
Forest_HighDiversity	0.553116089728383	0.68534833660536	0.497822379593039	0.523405001569518	0	0.569242046482229
Forest_LowDiversity	0.723287828668831	0.782484730632053	0.649394360809528	0.557895945457021	0.569242046482229	0
Forest_MediumDiversity	0.994515267618716	1	0.998625429553265	1	0.996818499650385	0.998657718120805
LowVegetation	0.94018897315834	0.95656976529877	0.989232155773878	0.994662436357695	0.968597398220022	0.958651854571807
Forest_HighDiversity	0.955115603705467	0.99864406779661	0.968903005991497	0.988401708610167	0.964193053605717	0.97430124627628
Forest_LowDiversity	0.951684436546145	0.998625429553265	0.961175350935895	0.986886991391772	0.959473727734387	0.975508315582341

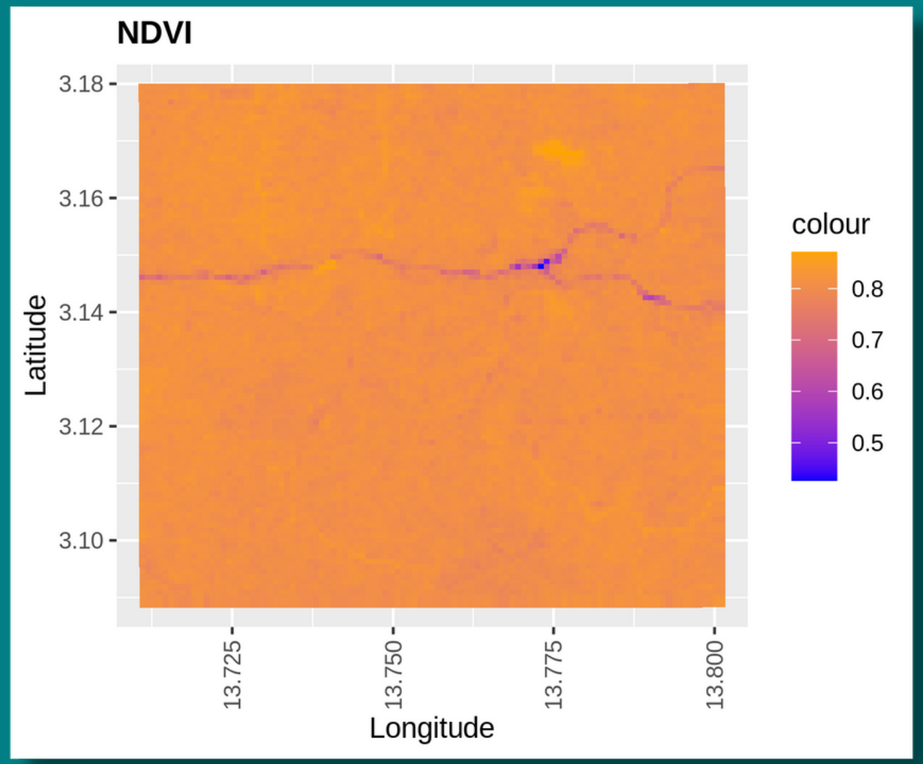
Output

- Bray curtis table
- comparison study

How does it look like ?



Compare diversity indicators



Prosail

Spectral indices

Spectral indices to know more about the well being of the vegetation.

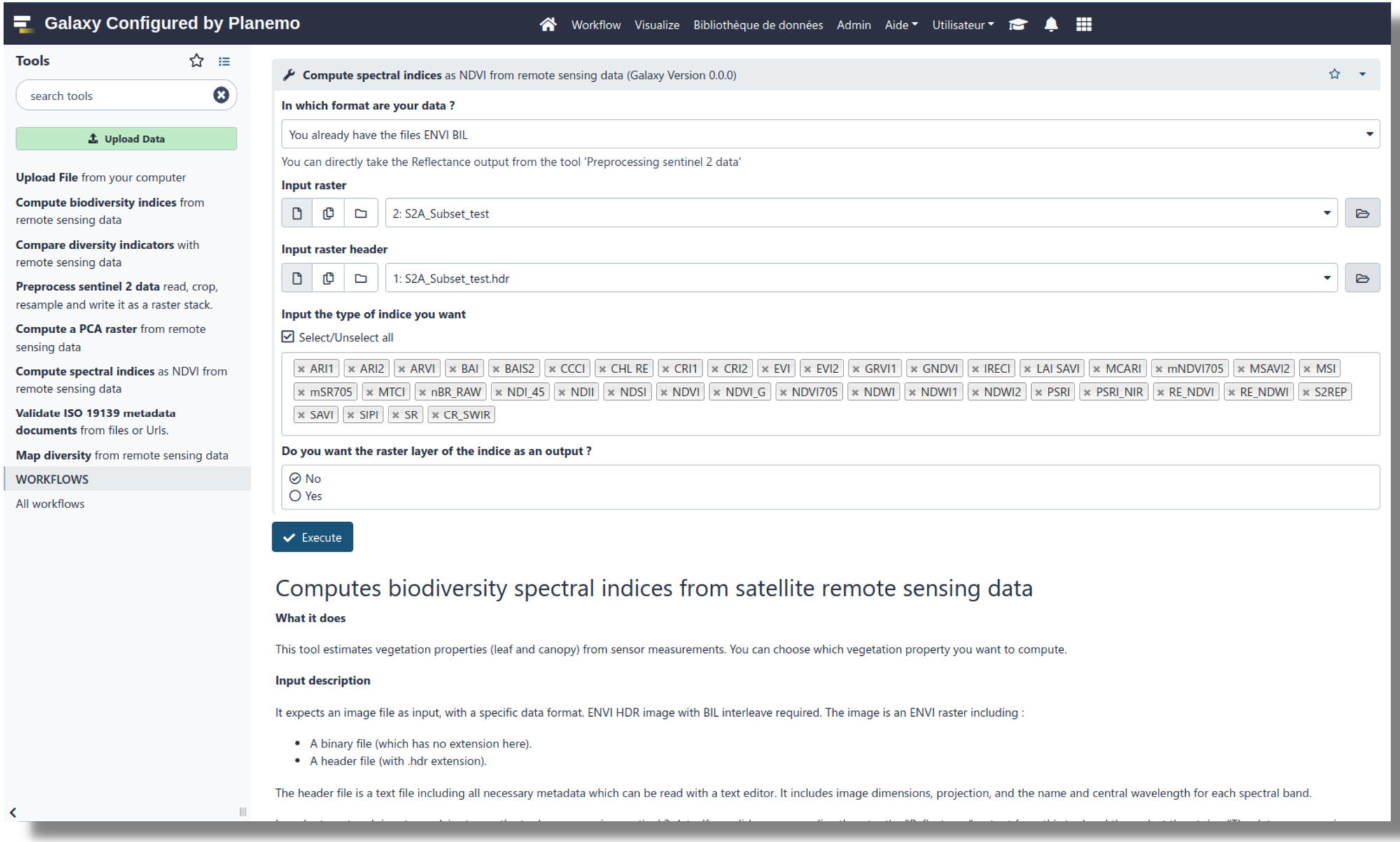
Input

The 2 envi bil files from the first tool

Output

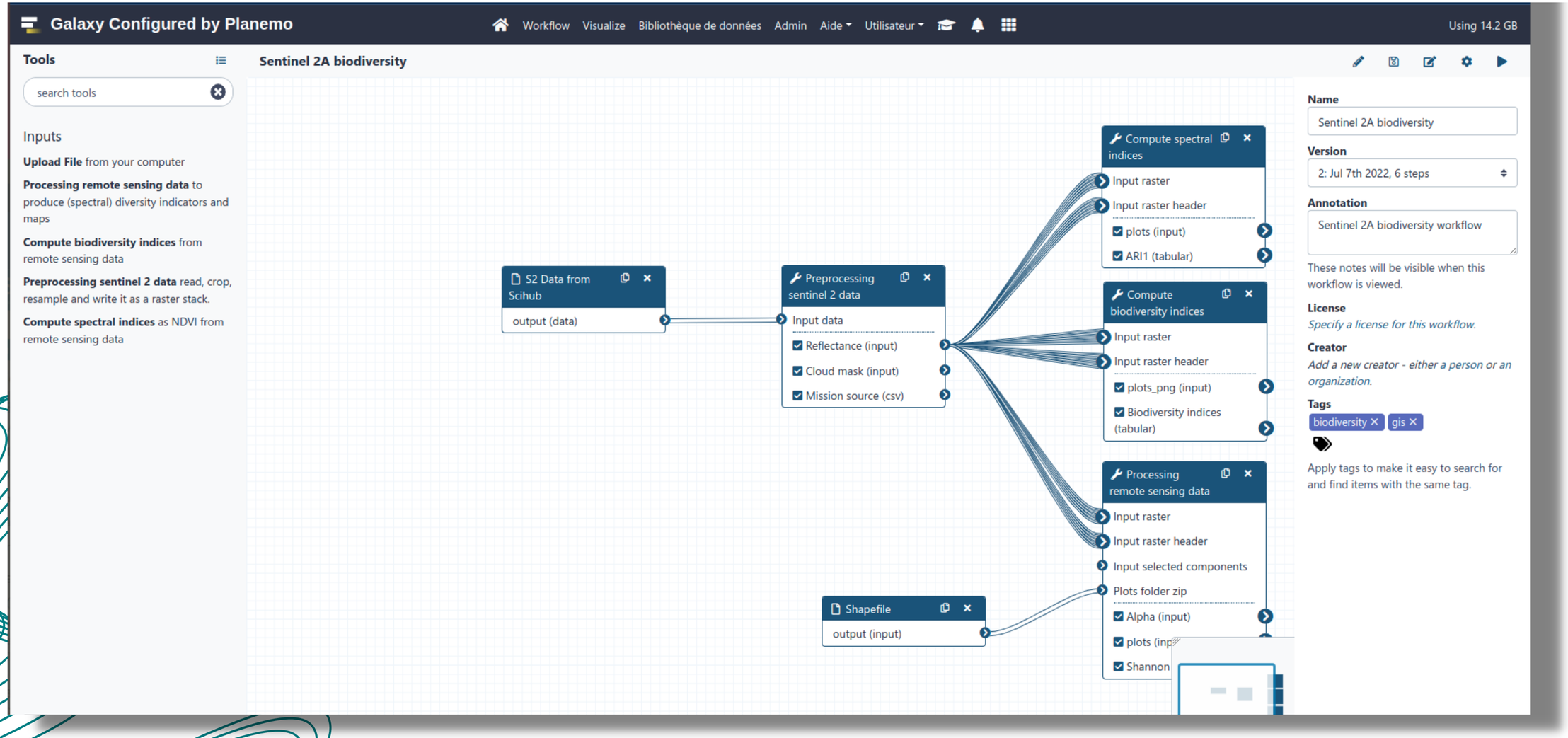
- A tabular on the indice you chose to compute (NDVI, CCCI, ...)
- Graphs on the indices
- The raster layer in envi bil format

S2A_Subset_test	longitude	latitude	NDVI
234.29	13.7115065213769	3.17883791054367	0.809475381273922
233.06	13.7124063428304	3.17883903826377	0.814533326859802
231.57	13.7133061646046	3.17884016519658	0.808063813546791
228.73	13.7142059866993	3.17884129134209	0.814678963045019
230.6	13.7151058091144	3.17884241670032	0.812649359747791
228.85	13.7160056318495	3.17884354127124	0.806605795437084
229.59	13.7169054549044	3.17884466505487	0.810899033966968



How does it look like ?

Sentinel 2 workflow

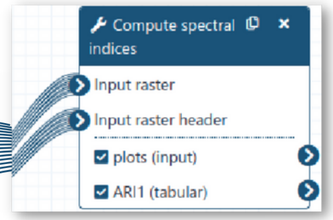


A tutorial is being developped to explained this workflow for biodiversity

SRS - EBV

Satellite remote sensing essential biodiversity variable

Add some of GEO BON EBV to Sentinel 2 workflow which are similar to spectral indices tool



Exemples

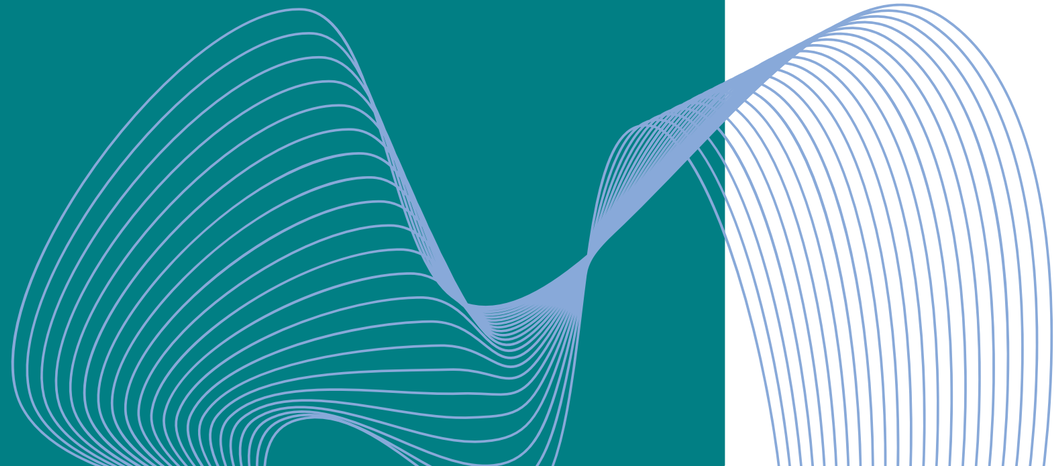
- Canopy chlorophyl content
- Vegetation active period
- Red list ecosystem

Sentinel 2 workflow for biodiversity indicators

Still in peer review should be available very soon with its tutorial

Biodiversity data exploration workflow

A fully operationnal workflow available on Galaxy-Ecology



Exploration steps

01 Get and clean in-situ data

02 Presence, absence and abundance

03 Statistics on presence-absence

04 Variables explorations

05 Homoscedasticity and normality

06 LCBD

Biodiversity

In situ data

Spatial

Remote sensing data

Thank you !