WISER
Weather and Climate Information Services for Africa

Digitisation of PRESASS/PRESAO Seasonal Forecasts: QGIS v3.4

Introduction

This document should allow the users to take a PRESASS seasonal forecast map, and turn it into a set of forecast probabilities on a latitude/longitude grid. This should facilitate verification of forecasts. The grid should be the same as the observations, that will be used in forecast verification; here, the CHIRPS grid is used.

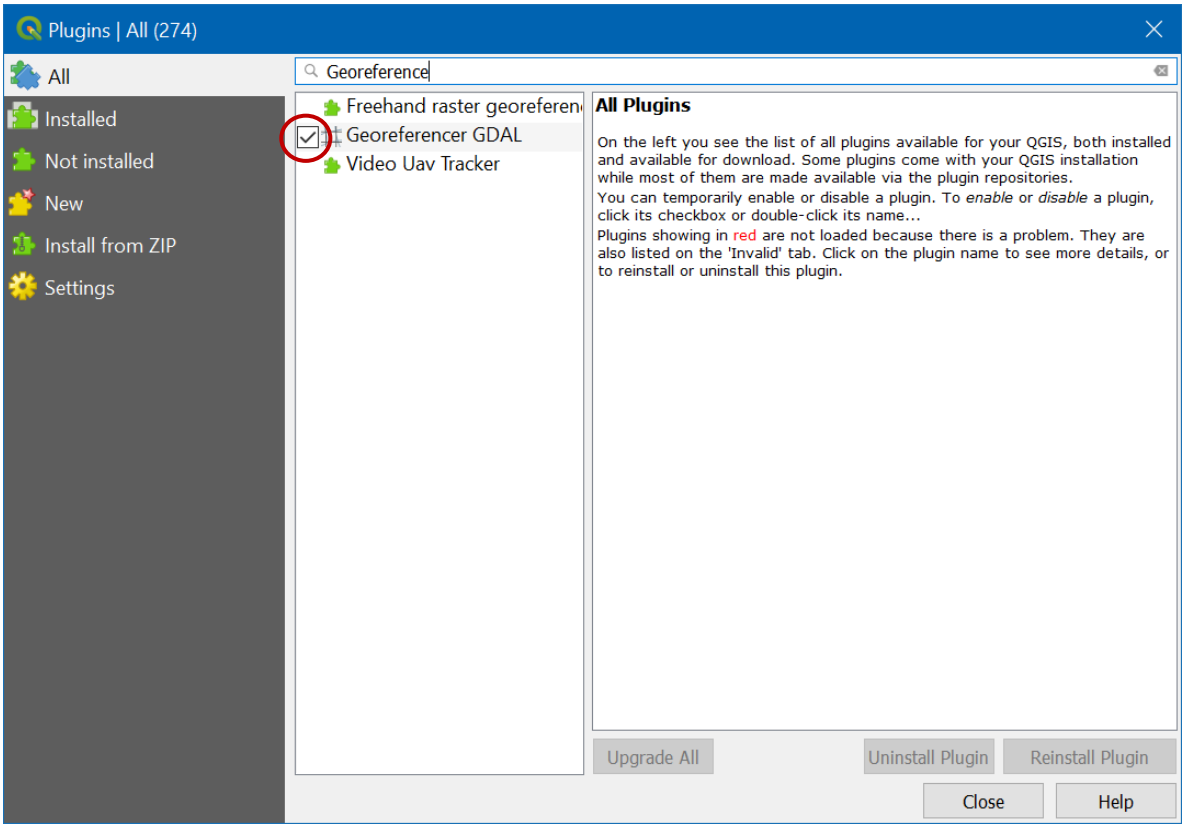
Prepared on 2019-02-06 by Jenny Pirret (Met Office), as part of the ASPIRE project within WISER.

Supported by: UKaid from the British people

Fund Manager: Met Office

Preliminary

- Install QGIS using https://qgis.org/en/site/forusers/download.html
- Have a PRESASS forecast map in .PNG format
- Enable the Georeferencer plugin. Go to Plugins menu -> Manage and Install Plugins. Search for ‘georeferencer’ and ensure the box next to it (circled in red on this screenshot) is filled:



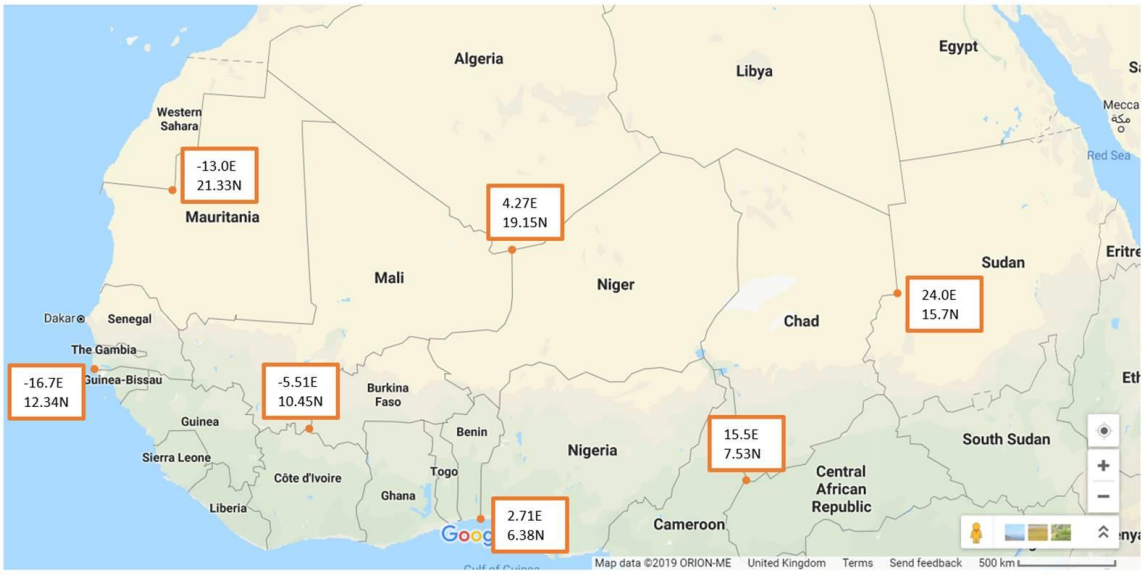
- Download global countries’ shapefiles from Natural Earth (ne_50m_admin_countries.shp), available from https://www.naturalearthdata.com/downloads/50m-cultural-vectors/50m-admin-0-countries-2/).

Supported by: UKaid from the British people

Fund Manager: Met Office

Part 1: Georeferencer

1. Start a new project.
2. Go to Raster -> Georeferencer…. A new window should open.
3. File -> Open Raster -> Browse for image of forecast. Once done, a window may open where need to specify the co-ordinate reference system; use WGS:84 / EPSG:4326.
4. Ensure that the icon labelled below is highlighted. Click on a point on the map and enter its latitude and longitude. Use a large spatial spread of points that can be clicked on accurately (e.g. corners or joints in borders). A set of example points are shown below. Repeat this several times.

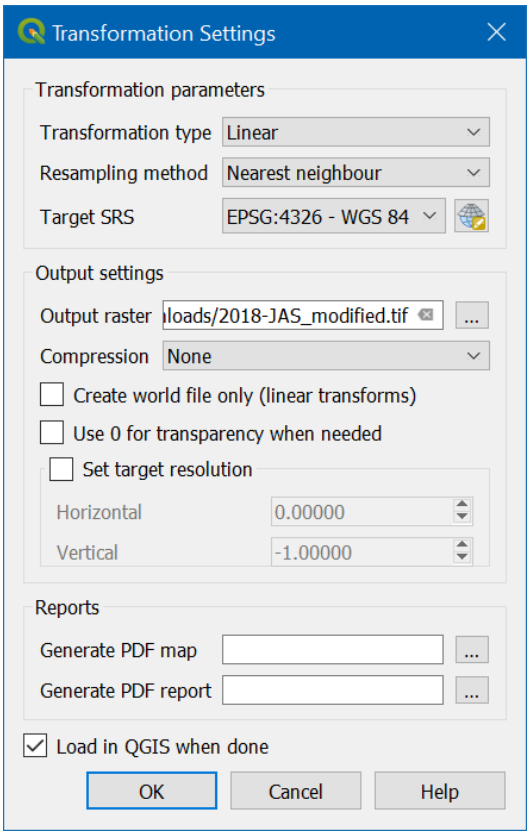


Supported by:
UKaid from the British people

Fund Manager:
Met Office

5. Settings -> Transformation settings. A new window should open. Ensure Transformation type is linear. Check the ‘Load in QGIS when done’ box. Click OK.
6. Click the ‘Start Georeferencing’ icon.
7. If the points in the Georeferencer window have a red line next to them (see illustration), check the table of points for any errors. Delete the layer in the main QGIS window by right-clicking in the layers panel. Correct any errors in the Georeferencer table and repeat step 6. Alternatively, close everything and start from Step 1.

8. Ensure the image has loaded in the main QGIS window, then close the Georeferencer window.

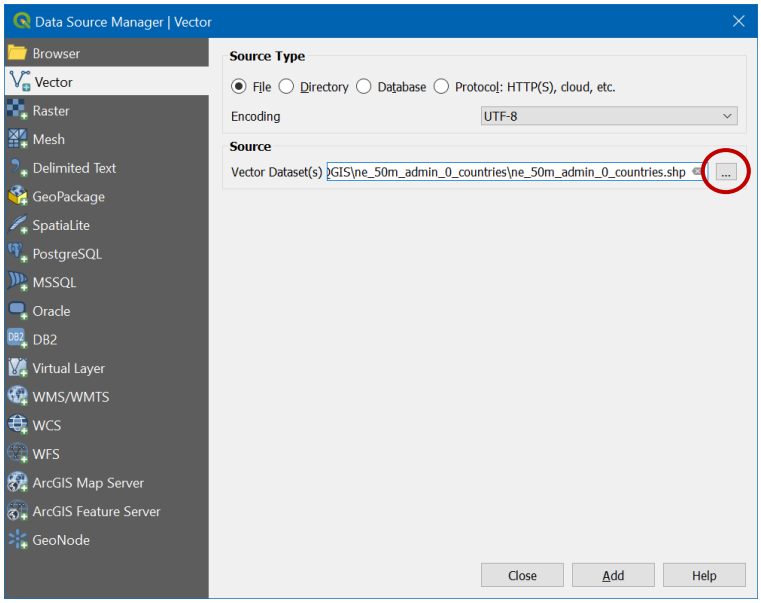


We recommend that now, you choose to view both the Layers Panel and Layer Styling. Select each in turn from View -> Panels, and a new window should open. If preferred, the window can be click-dragged to a side panel.

Supported by: UKaid from the British people
Fund Manager: Met Office

Part 2: Importing country boundaries

1. Add a layer for the Natural Earth shape file, containing all countries.



   a. In main QGIS window, go to Layer -> Add Layer -> Add Vector Layer.

   b. The Data source manager will open. Ensuring that 'Vector' is selected on the left-hand side, choose 'Source Type' as 'File'

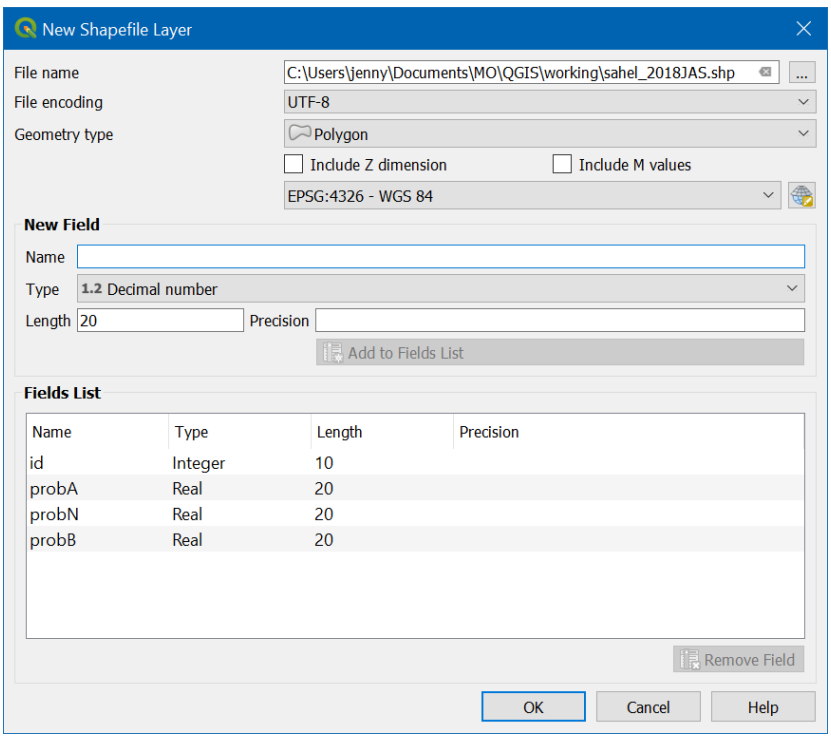
   c. Use the three dots at the end of the 'Vector Dataset' box to browse for the file ne_50m_admin_0_countries.shp

   d. Click 'Add', and the layer should appear in the main QGIS window. Then click close.

2. Create a new layer to contains only countries of interest

   a. Go to Layer -> Create Layer -> New Shapefile Layer… A new window opens.

   b. Next to 'File name', browse for a suitable location to save the shapefile and choose the filename to be of the format sahel_polygon_{year}.shp.



Supported by:

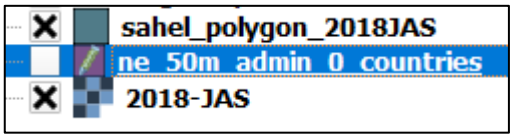
Fund Manager:

c. Select Type as Polygon.

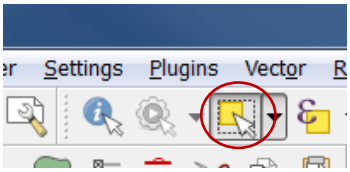
d. Under the ‘New Field’ heading, create three fields (probA, probN, probB). For each, enter the name, choose Type to be Decimal number, then click Add to fields list.

e. Click OK, and a new empty layer should appear in the main QGIS window.

3. In the Layers Panel of the main QGIS window, right click on the ne_50m_admin_0_countries layer and ‘toggle editing’. The icon for toggle editing is a yellow pencil, which will appear next to the layer in the Layers Panel.



4. Click the ‘Select Features’ icon – circled in the illustration. Either draw a box including all of the countries of interest, or press the ‘Shift’ key while clicking each country in turn.



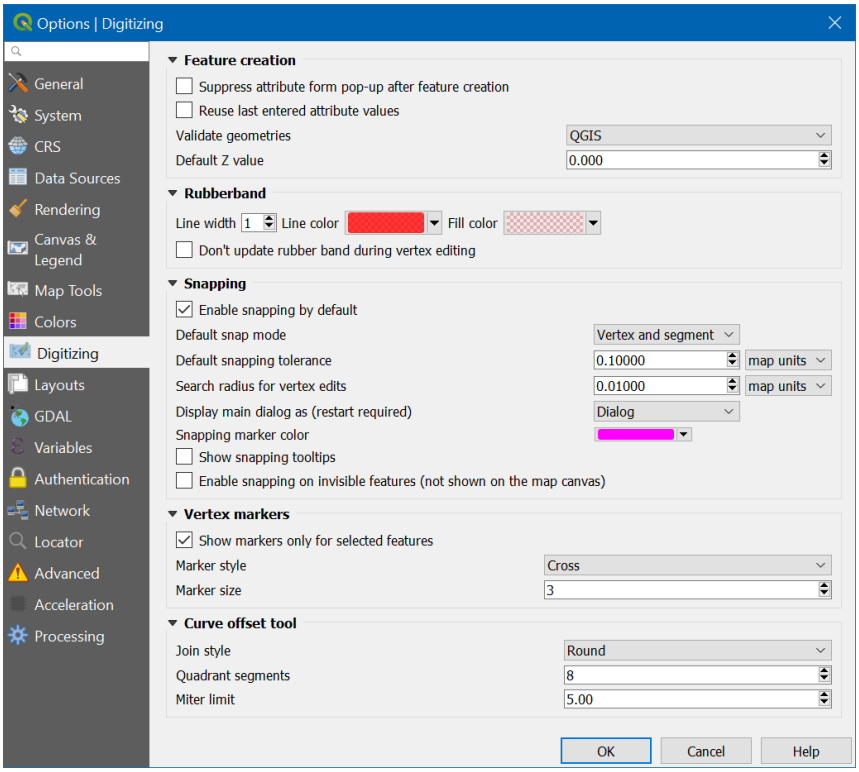
5. On the Edit menu, -> Copy Features.

6. Toggle editing off for the ‘ne_...’ layer by right-clicking and selecting it from the menu.

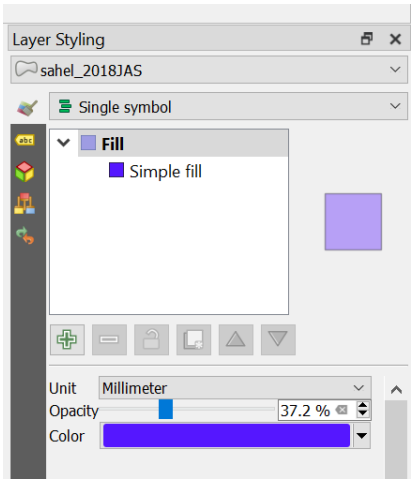
7. Toggle on editing for the ‘sahel_...’ layer. Using the Edit menu, -> Paste Features.

Part 3: Splitting into forecast areas

1. First, we must check the snapping options:
    a. Click Settings -> Options; a new window will open.
    b. On the left-hand side, choose ‘Digitisating’ and locate the ‘Snapping’ heading.
    c. Check the ‘enable snapping by default’ box
    d. Change both the ‘default snapping tolerance’ and ‘search radius for vertex edits’ to 0.1 map units.



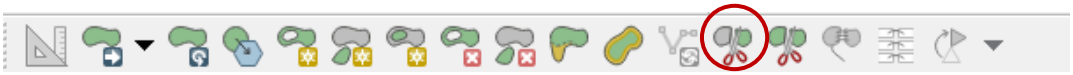
2. Next, we must ensure we can see the forecast map underneath the ‘sahel…’ layer.
    a. With the ‘sahel…’ layer selected, use the Layer Styling panel to reduce layer transparency (highlighted in the illustration to the right) so that the forecast underneath is visible.
    b. If needed, change the colour, to make the forecast map clearer.



Supported by:
UKaid from the British people

Fund Manager:
Met Office

3. Ensure you can see the Advanced Digitisation toolbar (if not visible, try View -> Toolbars). Use split features (circled below) to outline the forecast areas. We strongly recommend using an external mouse for this part. Some tips:

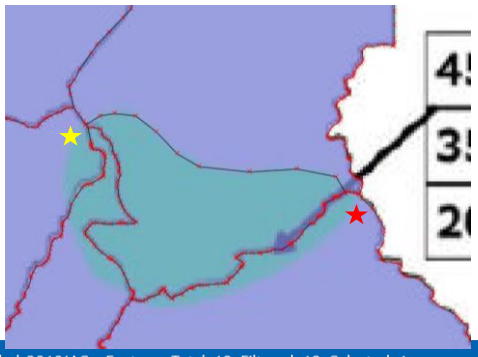


   a. Start the line outside the map area, or on the opposite side of another boundary. On picture, yellow star shows where line was started

   b. Zoom in and out of the map or use the hand tool to move the map, even part-way through splitting.

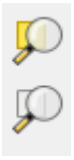
   c. Right click to finish once you've crossed a boundary. In example, this was done at the red star.

   d. Save the edits to this layer.



4. Open the attribute table by right-clicking on the 'sahel…' layer and choosing 'Open attribute table'

5. Selecting a row in the attribute table will highlight the related area on the map. Two useful tools for seeing which area is highlighted are zoom to selection (magnifying glass with yellow square) and zoom to layer (same but grey square, see illustration).



6. For each map area, enter the forecast probA, probN and probB into the attribute table (example shown to right).

sahel_2018JAS :: Features Total: 19, Filtered: 19, Selected: 1

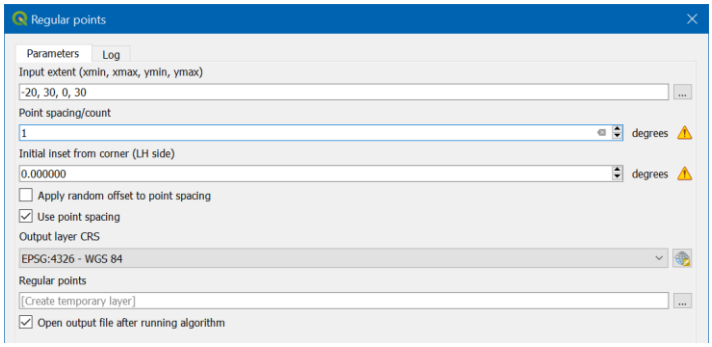
123 id = ε

	id	probA	probN	probB
1	NULL	NULL	NULL	NULL
2	NULL	45	35	20
3	NULL	NULL	NULL	NULL
4	NULL	NULL	NULL	NULL
5	NULL	NULL	NULL	NULL
6	NULL	NULL	NULL	NULL
7	NULL	20	40	40
8	NULL	NULL	NULL	NULL
9	NULL	NULL	NULL	NULL
10	NULL	NULL	NULL	NULL
11	NULL	40	45	15
12	NULL	NULL	NULL	NULL
13	NULL	20	40	40
14	NULL	NULL	NULL	NULL
15	NULL	NULL	NULL	NULL

7. Save edits and toggle editing off on the layer. This would also be a good point to save the whole QGIS project.

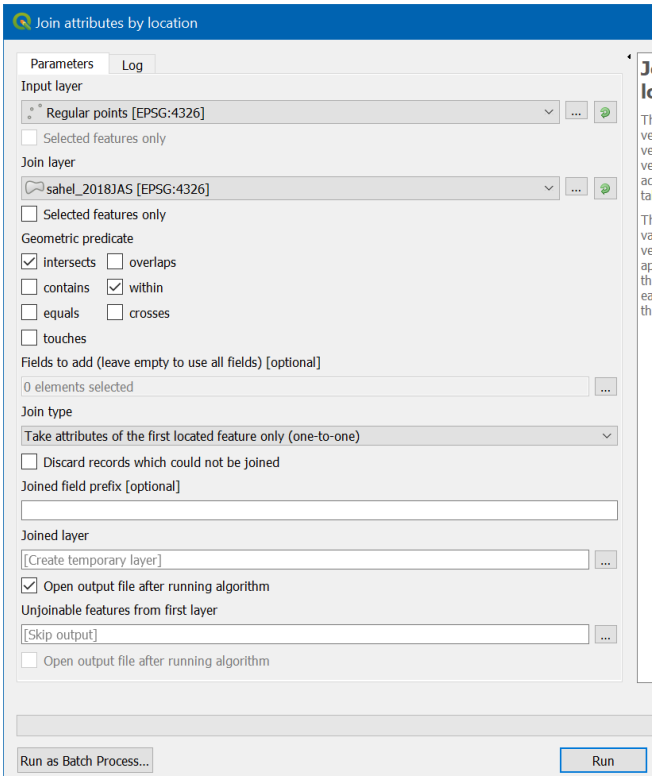
Part 4: Gridding and Exporting data

1. Create a regular grid, that matches the observations grid.
    a. In main QGIS window, go to Vector -> Research Tools -> Regular points
    b. For the Sahel, the input extent is: -20, 30, 0, 30.
    c. For CHIRPS data: Grid spacing: 1.0; Initial offset: 0.0



    d. Click Run, wait for it to do so, then close.

2. Merge the forecast attributes with the regular points. Go to Vector -> Data Management Tools -> Join attributes by location (see screenshot of new window below).
    a. Input layer: regular points
    b. Join layer: sahel_polygon_{year}
    c. Geometric predicate: intersects and within
    d. Join type: Take attributes of the first located feature only (one-to-one'
    e. Ensure the 'Discard records which could not be joined' box is <u>not</u> checked.
    f. Ensure the 'Open output file after running algorithm' box is checked
    g. Click Run; wait and close.



Supported by: UKaid from the British people

Fund Manager: Met Office

3. Open the attributes table for the merged layer to ensure that the attributes have transferred.

4. Export the gridded data to a .csv file.

    a. Right click the Joined layer -> Export -> Save as… A new window should open (see image, right)

    b. Format: Comma Separated Variable (CSV)

    c. File name: Browse using '…' to the location where you'd like to save the file. Name the file presass_{season}_{year}_grid.csv, e.g. presass_JAS_2017_grid.csv

    d. Under Layer Options, set GEOMETRY to AS_XY.

    e. Click OK.

5. You should now have a .csv file, containing columns for longitude (X), latitude (Y), and the forecast probabilities for each point.