How Perplex7 is modified to individual requirements

Contents

Edit Ports.txt

Use any text editor to change the Ports.txt file. First, a copy of the file should be saved in any directory for security reasons. The header line must not be deleted.

Delete any ports or lines that are not required, making sure that there are no empty lines.
Inserting a new port:
Format: Name of the port; latitude in decimal degrees; longitude in decimal degrees;
(South :== - or West:== -)

```
Port; Latitude; Longitude
Aalborg(da); 57.05; 9.9333
Aarhus(da); 56.15; 10.2167
Aberdeen(uk); 57.15; -2.0833


Wismar(gm); 53.9; 11.4667
Wolgast(gm); 54.05; 13.7833
Yokohama(ja); 35.4500; 139.5833
```

Save Ports.txt in folder ..\Dataset

Edit Default_InstrTable.mat

First, a copy of the MAT-file should be saved in any directory for security reasons.

Execute Matlab and choose your folder containing Perplex7 source code which also contains the MAT-file Default_InstrTable.mat. Load this file and find the table “I” in Workspace; see Figure 1 below.

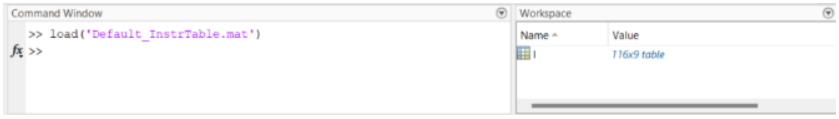


Fig. 1: Screen shot of Command Window and Workspace

Go into the Workspace and double-click on "I" which opens the table; see Figure 2.

Variables - I

I

116x9 table

	1 Used	2 Instrument	3 Description	4 User	5 Fixed	6 Handling	7 Down	8 Trawling	9 Up	10
1	0	"ADCP"	"Acoustic Do...	"nn"	0	0	0	0	0	
2	0	"AEROS"	"Aerosol Sam...	"nn"	0	0	0	0	0	
3	0	"AIRGN"	"Airgun - Seis...	"nn"	0	0	0	0	0	
4	0	"AIRS"	"Air sampler"	"nn"	0	0	0	0	0	
5	0	"ALTI"	"Altimeter"	"nn"	0	0	0	0	0	
6	0	"ATURBP"	"Air Turbulen...	"nn"	0	0	0	0	0	
7	0	"AUV"	"Autonomous...	"nn"	0	0	0	0	0	
8	0	"BC"	"Box Corer"	"nn"	0	0	0	0	0	
9	0	"BN"	"Bottom Net"	"nn"	0	0	0	0	0	
10	0	"BOAT"	"Boat"	"nn"	0	0	0	0	0	
11	0	"BOO"	"Boomer - Sei...	"nn"	0	0	0	0	0	
12	0	"BS"	"Benthos Sam...	"nn"	0	0	0	0	0	
13	0	"BT"	"Bathythermo...	"nn"	0	0	0	0	0	
14	0	"BUOY"	"Buoy"	"nn"	0	0	0	0	0	
15	0	"CALIB"	"Calibration"	"nn"	0	0	0	0	0	
16	0	"CCN"	"Cloud Conde...	"nn"	0	0	0	0	0	
17	0	"CHAM"	"Benthic cha...	"nn"	0	0	0	0	0	
18	0	"CM"	"Current Mete...	"nn"	0	0	0	0	0	

Fig. 2: Screen shot showing table "I"

Delete instruments that are permanently not required:

- Delete only one instrument or only one line of the table
  e.g. delete "Altimeter" from table "I" (this is line 5)
  Command Window:
  >> I(5,:) = [];
- Delete a sequence of instrument
  e.g. delete "Boat" to "Bathythermograph" from table "I" (these are line 10 to 13)
  Command Window:
  >> I(10:13,:) = [];

Insert new instruments:

- Go into "Variables – I" and scroll down to last filled line, here line number 116.
- Click in table cell (117,1) and enter a 0; automatically (117,5:9) are filled with 0 too.
- Click in table cell (117,2) and enter e.g. "GAPS"
- Click in table cell (117,3) and enter e.g. "Xblue Gaps USBL Nav"
- Click in table cell (117,4) and enter e.g. "nn"
- Sort table: Go into Command Window
  >> I = sortrows(I,2);

Specify the typical times and the down- and up speeds for the use of an instrument:

- Edit column 4 to 9.
- The name of the "User" may change for every cruise.
- "Fixed" is the time in hours that an instrument requires when used at a station, i.e. independent of the water depth or the down- and up speed.
- Handling is the time in minutes required to bring a device into the water or back on deck.

- The down and up speeds in m/s together with the water depth give the time required for hoisting and lowering. A bottom grab, for example, can be lowered relatively quickly, but must be hoisted slowly so that the sample is not damaged.
- Trawling is the time in minutes that, for example, a net is still being dragged after lowered in a specific water depth.

Save changes in Default_InstrTable.mat:

In Command Window enter (in working in your Perplex7 folder):

```
>> save('Default_InstrTable.mat','I');
```

Perplex7.mlapp inside

This chapter shows how Perplex can be modified. As an example, the sea ice concentration can also be shown on the map (see tab “Map”) as an option, so that the respective ship speed can be selected more precisely during planning.

Where to find the data?

The sea ice concentration can be found here:
https://data.meereisportal.de/relaunch/index.php?lang=en

Go to *Maps & Data*, next to *Parameter* and then select *Sea ice concentration*.

For example, if you are planning a trip to Antarctica in December and January, you can download the currently available data on December 1, December 15, January 1, January 15 and January 31. However, the corresponding data set with the geocoordinates (longitude, latitude) must also be downloaded beforehand; see red arrow in Figure 3 and find “LongitudeLatitudeGrid-s6250-Antarctic.hdf” in your download folder.

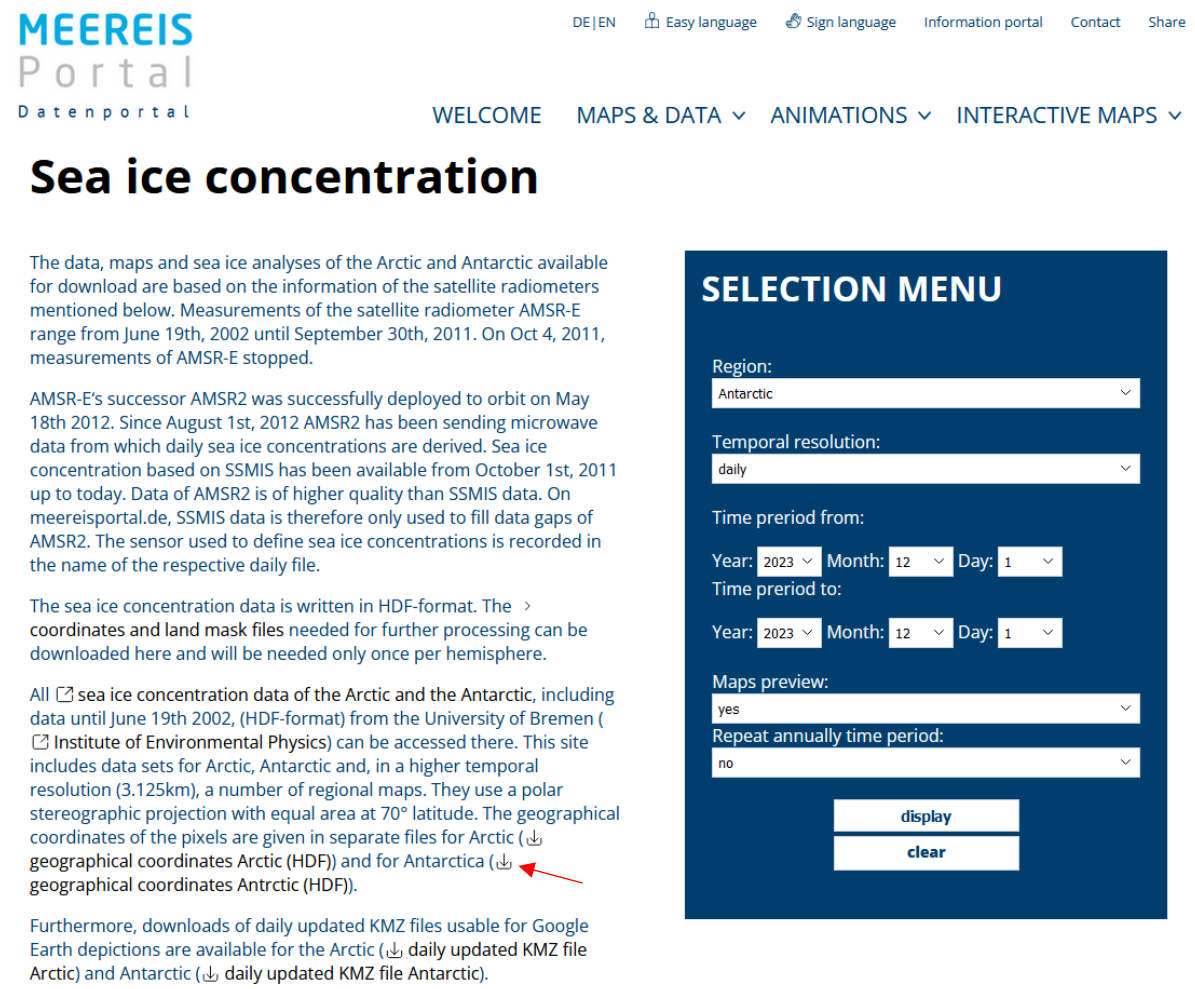


Fig. 3: “Meereis Portal” to download sea ice concentration and geographical coordinates; see red arrow.

After pressing [display], the map with the sea ice concentration is displayed. The data can then be downloaded as an HDF file. Data from a different date can be saved in the same way. Find in your download folder: “asi-AMSR2-s6250-20231201-v5.4.hdf”; see Figure 4.

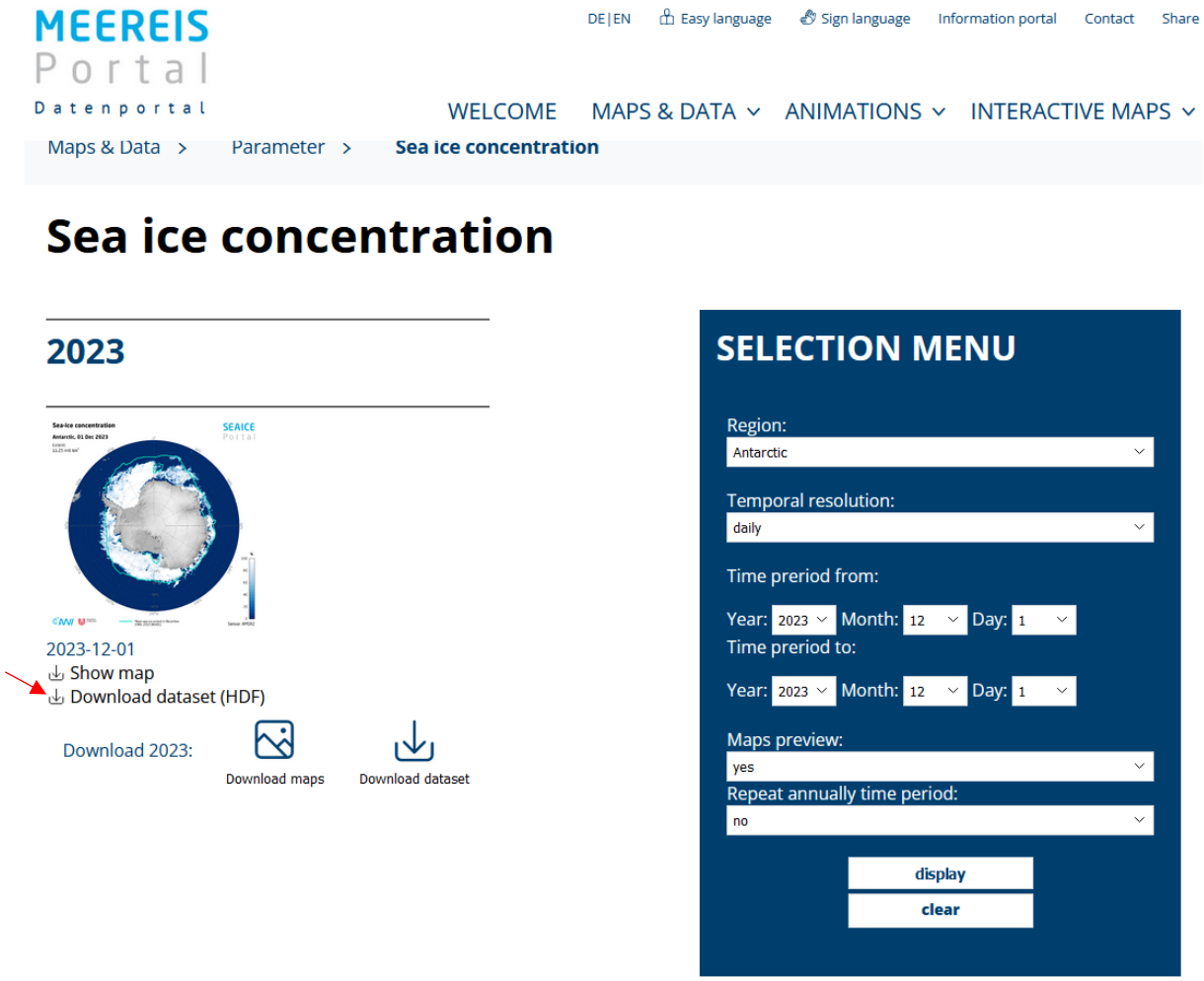


Fig. 4: Shows the Sea ice concentration of December 1st 2023. The red arrow shows where to get the HDF file, which we like to display in the map of the Perplex7 software.

Move the HDF-Files into your Matlab directory: C:\<your perplex working directory>\Data set.

How is a specific HDF file selected in Perplex7?

Before changes are made to the source code, a backup of the complete directory should be made.

In order to be able to access sea ice concentrations from different dates in Perplex7, we need to add a selection option.

Execute Matlab and open Perplex7.mlapp in the App Designer. The Design View shows five tabs: Cruise, Stations, Casts, Map and Instruments. It makes sense to insert the selection of a specific sea ice file (HDF) in the Cruise tab.

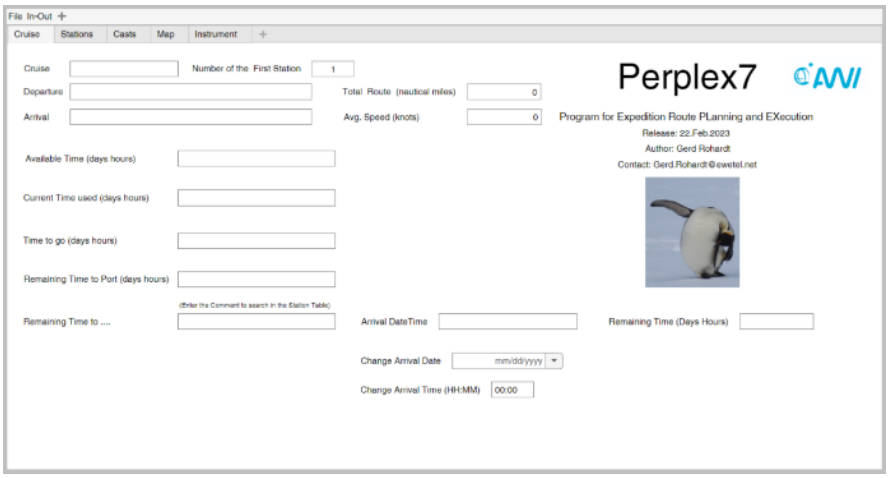


Fig. 5: Unchanged view after executing Perplex7

Use App Designer (Design View) and add “Edit Field(Text)” and two “Button” and change text strings, that the Cruise tab looks like shown in Figure xx.

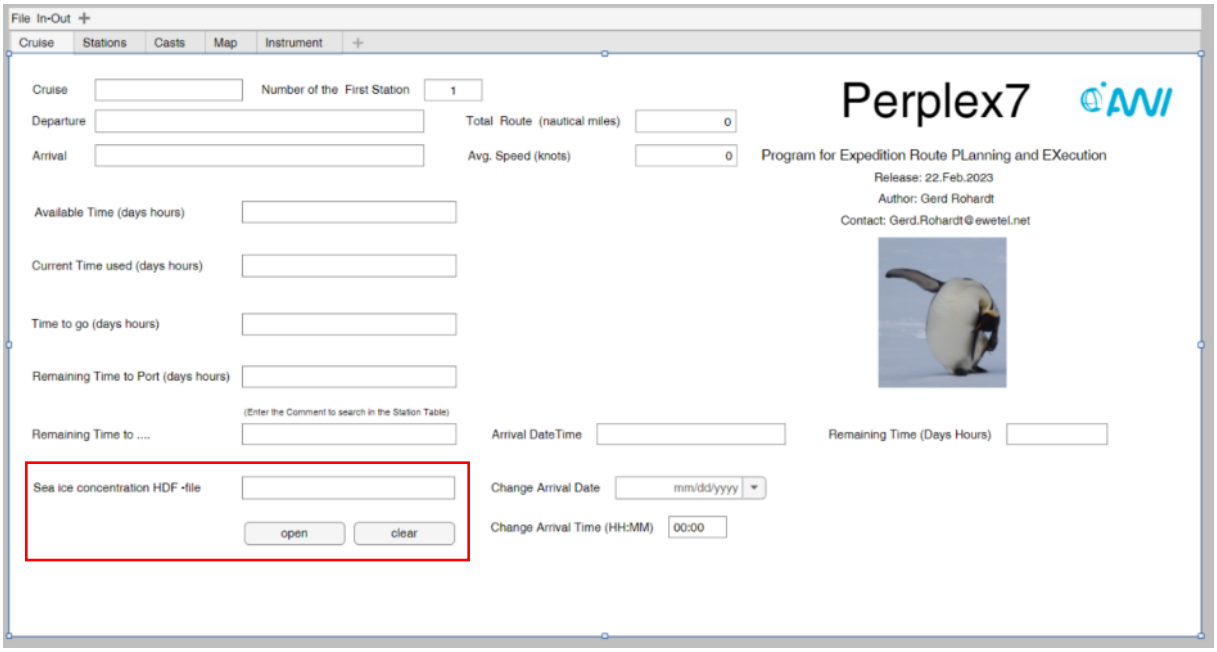


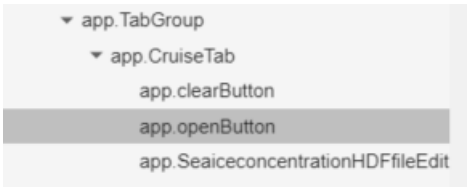
Fig. 6: The red box marks the parts that have been added to the cruise tab.

Add and modify source code in Perplex7.mlapp

The "open" button should open the menu to select an HDF file of the sea ice concentration from a directory. The HDF filename is then displayed in the Edit Field (Text). The button "clear" the displayed HDF file. If an HDF file is displayed in the Edit Field (Text), the sea ice concentration is also displayed when plotting the map (see Map tab).

Step 1: Insert function for “openButton”

Insert a function when pressing the button [Open].



On the right in App Designer (Design View), you can see the newly inserted parts, where you first mark **app.open.Button** with a click LMB (left mouse button) and then use the RMB (right mouse button) to open further menus, go to **Callbacks** and select **AddPushButtonCallback**.

```
        % Button pushed function: openButton
        function openButtonPushed(app, event)

        end
```

At the end of the source code, you have entered in Perplex7.mlapp you will find the function to insert the required commands/functions that are to be executed when the "open" button is pressed. Also, add comments for explanation.

```
% Button pushed function: openButton
function openButtonPushed(app, event)
    % Execute when pressing [open] from tab cruise to select a HDF
    % file with sea ice concentration
    % Note: save HDF-files in folder "Dataset" of our main Perplex7 working directory
    sci_file = fullfile(app.pn,'Dataset','*.hdf'); % see startupFcn concerning app.pn
    % uigetfile shows all HDF files, select the needed date
    [app.scifn,app.scipn] = uigetfile(sci_file,'Open HDF-File');
    % display the filename of the selected HDF file in TAB Cruise
    app.SeaiceconcentrationHDFfileEditField.Value = app.scifn;
    app.SCIfile = fullfile(app.scipn,app.scifn);
    % Update Plot
    cla(app.UIAxes);
    [app.mstruct,app.h] = Plot_Map(app.S,app.data.LATLIM, ...
        app.data.LONLIM,app.latcenter,app.loncenter,...
        app.radius,app.plteez,app.SCIfile);
end
```

Use the uigetfile function to select an HDF file from the "Dataset" folder. Only the file name is displayed in the newly created text field. The Plot_Map is then executed, i.e. the map is recreated in the Map tab and the sea ice concentration is superimposed.

Note: Newly inserted variables must be declared in "properties"; see red box below.

```
properties (Access = public)
    pn  % pathname taken during startup
    CR  % new cruise name.
    rowm % selected row in Station tab
    selwp % nr of waypoint/station to compute remaining time up to here
    err % error messages from check_datasets
    PS  % Structure
    fn  % filename
    S   % Stations or Wayponits (table)
    C   % Casts (cell)
    H   % Header (structure)
    I   % Instruments (table)
    dtrow   % row of selected DateTim in Station Table
    DTtmp   % save DateTime in selected row before it was changed
    latgrd  % latitude from GRIDONE_2D.mat
    longrd  % longitude from GRIDONE_2D.mat
    Zgrd    % Z == waterdepth from GRIDONE_2D.mat
    latcenter   % center latitude for zooming stereo projection
    loncenter   % center longitude for zooming stereo projection
    radius  % zoom raduius for stereo projection
    plteez % controls plotting of eez

    scipn % pathname of the HDF-file
    scifn % filename of the HDF-file
    SCIfile % string with path and filename
end
```

Step 2: Insert function for “clearButton”

As in step 1, the function for the "clear" button is inserted.

```
% Button pushed function: clearButton
function clearButtonPushed(app, event)
    % Execute when pressing [clear] from tab cruise to clear
    % app.SeaiceconcentrationHDFfileEditField
    app.SeaiceconcentrationHDFfileEditField.Value = '';
    % clear app.scifn too:
    app.scifn ='';
    app.SCIfile ='';
    % Update Plot
    cla(app.UIAxes);
    [app.mstruct,app.h] = Plot_Map(app.S,app.data.LATLIM, ...
        app.data.LONLIM,app.latcenter,app.loncenter,...
        app.radius,app.plteez,app.SCIfile);
end
```

Step 3: Insert and check Plot_Map function

The filename of the HDF file must be inserted Plot_Map function. Search “Plot_Map” in Perplex7.mlapp and add in all “app.SCIfile”. (Use e.g. Find in the App Designer EDITOR menu bar.)

```
[app.mstruct,app.h] = Plot_Map(app.S,app.data.LATLIM, ...
    app.data.LONLIM,app.latcenter,app.loncenter,...
    app.radius,app.plteez,app.SCIfile);
```

Step 4: Plot_Map in Perplex.mlapp startupFcn(app)

Note that app.SCIfile must be defined at the start of Perplex7. To do this, the function startupFcn must be changed as in the section marked in red.

```
            % Plot Map
            cla(app.UIAxes);
            if app.data.LATLIM(2)> 86
                app.ZoomBoxButton.Enable = false;
                app.ZoomOUTButton.Enable = false;
                app.CenterButton.Enable = true;
            else
                app.ZoomBoxButton.Enable = true;
                app.ZoomOUTButton.Enable = true;
                app.CenterButton.Enable = false;
            end
            app.radius = app.RadiusEditField.Value;
            app.scifn =  app.SeaiceconcentrationHDFfileEditField.Value;
            app.scipn = fullfile(app.pn,'Dataset');
            if isempty(app.scifn)
                app.SCIfile ='';
            else
                app.SCIfile = fullfile(app.scipn,app.scifn);
            end
            [app.mstruct,app.h] = Plot_Map(app.S,app.data.LATLIM, ...
            app.data.LONLIM,app.latcenter,app.loncenter,...
            app.radius,app.plteez,app.SCIfile);
        else
            % no Perplex7_cfg.mat found --> create an new cruise:
            app.DialogApp = DialogNew_Cruise(app);
        end
    end
```

Modify M-File Plot_Map.m

The HDF file and the corresponding geographical coordinates must be read into Plot_Map and are displayed in this example using the geoshow function. This is done before plotting the coastlines and the cruise route so that the sea ice concentration appears as a background.

Also note that different geographical coordinates must be read in for the Arctic and Antarctic. To do this, search for the string "**n**6250" in the file name of the sea ice concentration (Arctic). For the Antarctic the string would be "**s**6250"

Old:

```
function [mstruct,h] = Plot_Map(S,LATLIM,LONLIM,latcenter,loncenter,radius,plteez)
```

New:

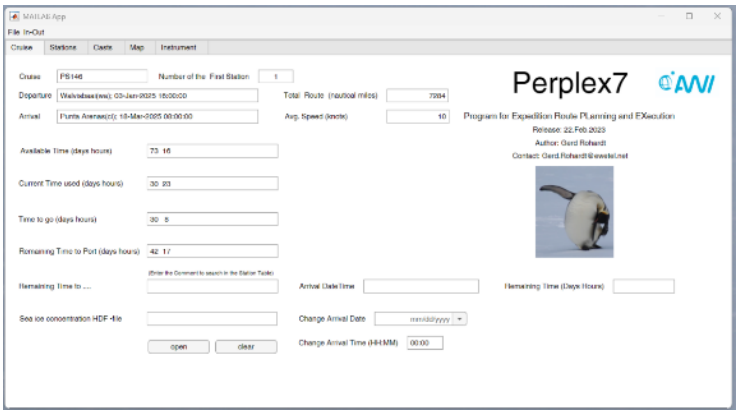
```
function [mstruct,h] = Plot_Map(S,LATLIM,LONLIM,latcenter,loncenter,radius,plteez,scifile)
% Plot map ship route with coastlines, waypoints and stations
% new addition: plot sea ice concentration
% skip plotting sea ice concentration when scifile is empty
```

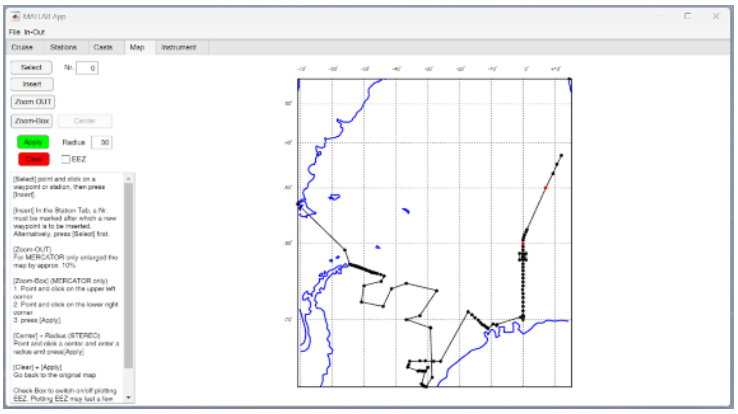
And further insert beginning at line 120:

```
if ~isempty(scifile)
        % Plotting sea ice concentration; e.g. asi-AMSR2-s6250-20231201-v5.4.hdf
        % Arctic or Antarctic?
        % get path of the scifile to open LongitudeLatitudeGrid
        [scipn,scifn,~] = fileparts(scifile);
        wo = strfind(scifn,'n6250');
        if ~isempty(wo)
            % Arctic
            latlonfile =fullfile(scipn,'LongitudeLatitudeGrid-n6250-Arctic.hdf');
        else
            % Antarctic
            latlonfile =fullfile(scipn,'LongitudeLatitudeGrid-s6250-Antarctic.hdf');
        end

        Info     = hdfinfo(latlonfile);
        InfoSCI     = hdfinfo(scifile);

        latsci   = hdfread(latlonfile,Info.SDS(2).Name);
        lonsci  = hdfread(latlonfile,Info.SDS(1).Name);

        sic   = hdfread(scifile,InfoSCI.SDS.Name);

        geoshow(latsci, lonsci, sic,'DisplayType','texturemap');
end
```

Run and verify code change in Perplex7.mlapp and Plot_Map.m

No Sea Ice:





Select Sea Ice Concentration from 1. Dec. 2023