

How Perplex7 is modified to individual requirements

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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.

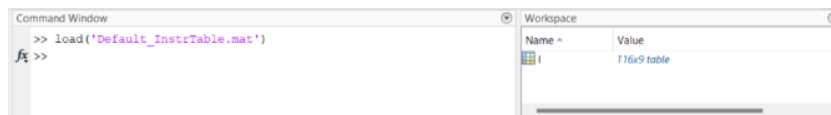


Fig. 1: Screen shot of Command Window and Workspace

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

	1 Used	2 Instrument	3 Description	4 User	5 Fixed	6 Handling	7 Down	8 Trawling	9 Up	10	11
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"	"Bathymetro..."	"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 “Bathymograph” 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.

The screenshot shows the MEEREIS Portal website. The header includes the logo 'MEEREIS Portal Datenportal' and navigation links: 'DE|EN', 'Easy language', 'Sign language', 'Information portal', 'Contact', and 'Share'. Below the header is a navigation bar with 'WELCOME', 'MAPS & DATA', 'ANIMATIONS', and 'INTERACTIVE MAPS'. The main heading is 'Sea ice concentration'. The text describes the data sources (AMSRE and AMSR2) and provides instructions on how to access the data. A red arrow points to a download link for geographical coordinates. On the right, a 'SELECTION MENU' form allows users to select the region (Antarctic), temporal resolution (daily), time period (from 2023-12-01 to 2023-12-01), maps preview (yes), and repeat annually time period (no). The 'display' button is highlighted.

The data, maps and sea ice analyses of the Arctic and Antarctic available for download are based on the information of the satellite radiometers mentioned below. Measurements of the satellite radiometer AMSR-E range from June 19th, 2002 until September 30th, 2011. On Oct 4, 2011, measurements of AMSR-E stopped.

AMSR-E's successor AMSR2 was successfully deployed to orbit on May 18th 2012. Since August 1st, 2012 AMSR2 has been sending microwave data from which daily sea ice concentrations are derived. Sea ice concentration based on SSMIS has been available from October 1st, 2011 up to today. Data of AMSR2 is of higher quality than SSMIS data. On meereisportal.de, SSMIS data is therefore only used to fill data gaps of AMSR2. The sensor used to define sea ice concentrations is recorded in the name of the respective daily file.

The sea ice concentration data is written in HDF-format. The coordinates and land mask files needed for further processing can be downloaded here and will be needed only once per hemisphere.

All sea ice concentration data of the Arctic and the Antarctic, including data until June 19th 2002, (HDF-format) from the University of Bremen (Institute of Environmental Physics) can be accessed there. This site includes data sets for Arctic, Antarctic and, in a higher temporal resolution (3.125km), a number of regional maps. They use a polar stereographic projection with equal area at 70° latitude. The geographical coordinates of the pixels are given in separate files for Arctic (geographical coordinates Arctic (HDF)) and for Antarctica (geographical coordinates Antarctic (HDF)).

Furthermore, downloads of daily updated KMZ files usable for Google Earth depictions are available for the Arctic (daily updated KMZ file Arctic) and Antarctic (daily updated KMZ file Antarctic).

SELECTION MENU

Region: Antarctic

Temporal resolution: daily

Time period from: Year: 2023 Month: 12 Day: 1

Time period to: Year: 2023 Month: 12 Day: 1

Maps preview: yes

Repeat annually time period: no

display

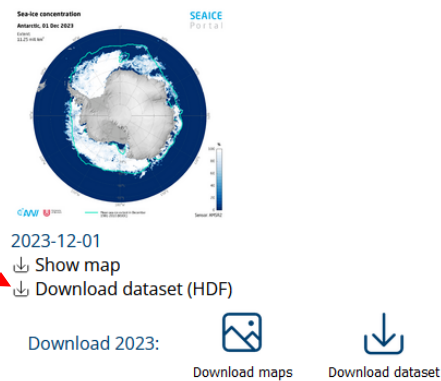
clear

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.

Sea ice concentration

2023



SELECTION MENU

Region:
Antarctic ▾

Temporal resolution:
daily ▾

Time period from:
Year: 2023 ▾ Month: 12 ▾ Day: 1 ▾

Time period to:
Year: 2023 ▾ Month: 12 ▾ Day: 1 ▾

Maps preview:
yes ▾

Repeat annually time period:
no ▾

[display](#)

[clear](#)

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.

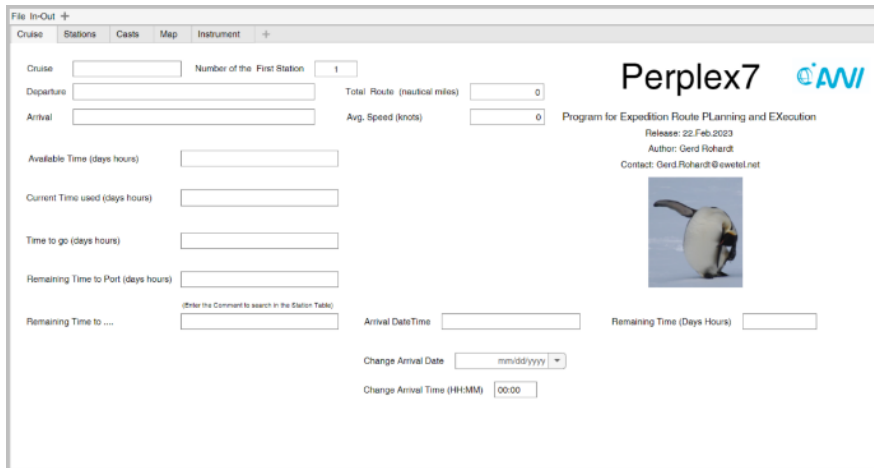


Fig. 5: Unchanged view after executing Perplex7

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.

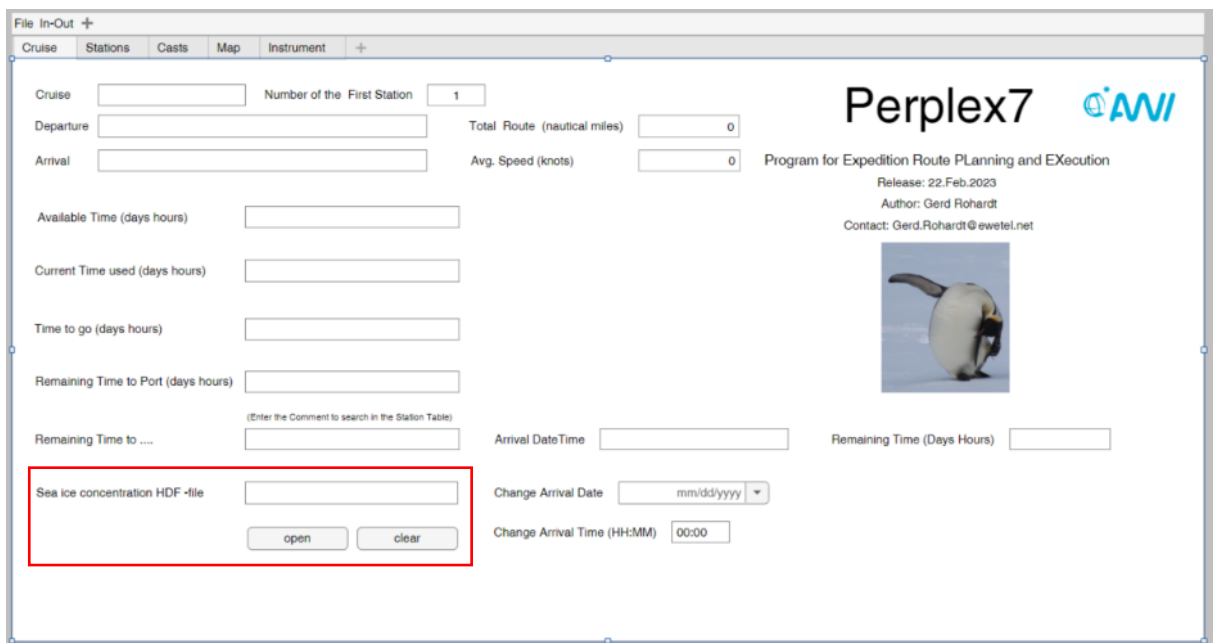


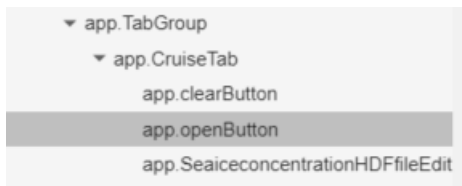
Fig. 6: The red box marks the parts that have been added to the cruise tab.

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 Waypoints (table)
    C % Casts (cell)
    H % Header (structure)
    I % Instruments (table)
    dtrow % row of selected DateTime 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 radius 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 "n6250" in the file name of the sea ice concentration (Arctic). For the Antarctic the string would be "s6250"

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
```

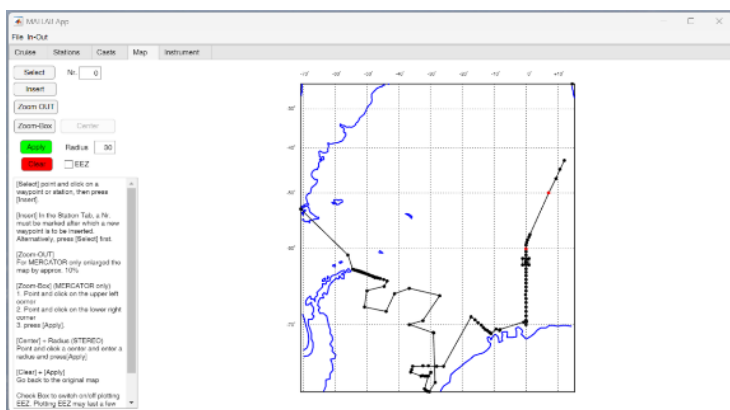
Run and verify code change in Perplex7.mlapp and Plot_Map.m

No Sea Ice:

Perplex7

Program for Expedition Route Planning and Execution
Release: 22 Feb 2023
Author: Gerd Rohardt
Contact: Gerd.Rohardt@awi.de

Sea ice concentration HDF file:



Select Sea Ice Concentration from 1. Dec. 2023

Sea ice concentration HDF file:

