Baltic Marine Environment Protection Commission

Maritime Group
Klaipeda, Lithuania, 23-25 November 2015

MARITIME 15-2015

Document title	Baltic SCOPE project
Code	2-3-Add.1
Category	INF
Agenda Item	2 - Matters arising from HELCOM meetings
Submission date	03.11.2015
Submitted by	Secretariat
Reference	MARITIME 15-2015, document 2-3

Background

This document contains additional information concerning the Baltic SCOPE project and AIS data processing.

Action required

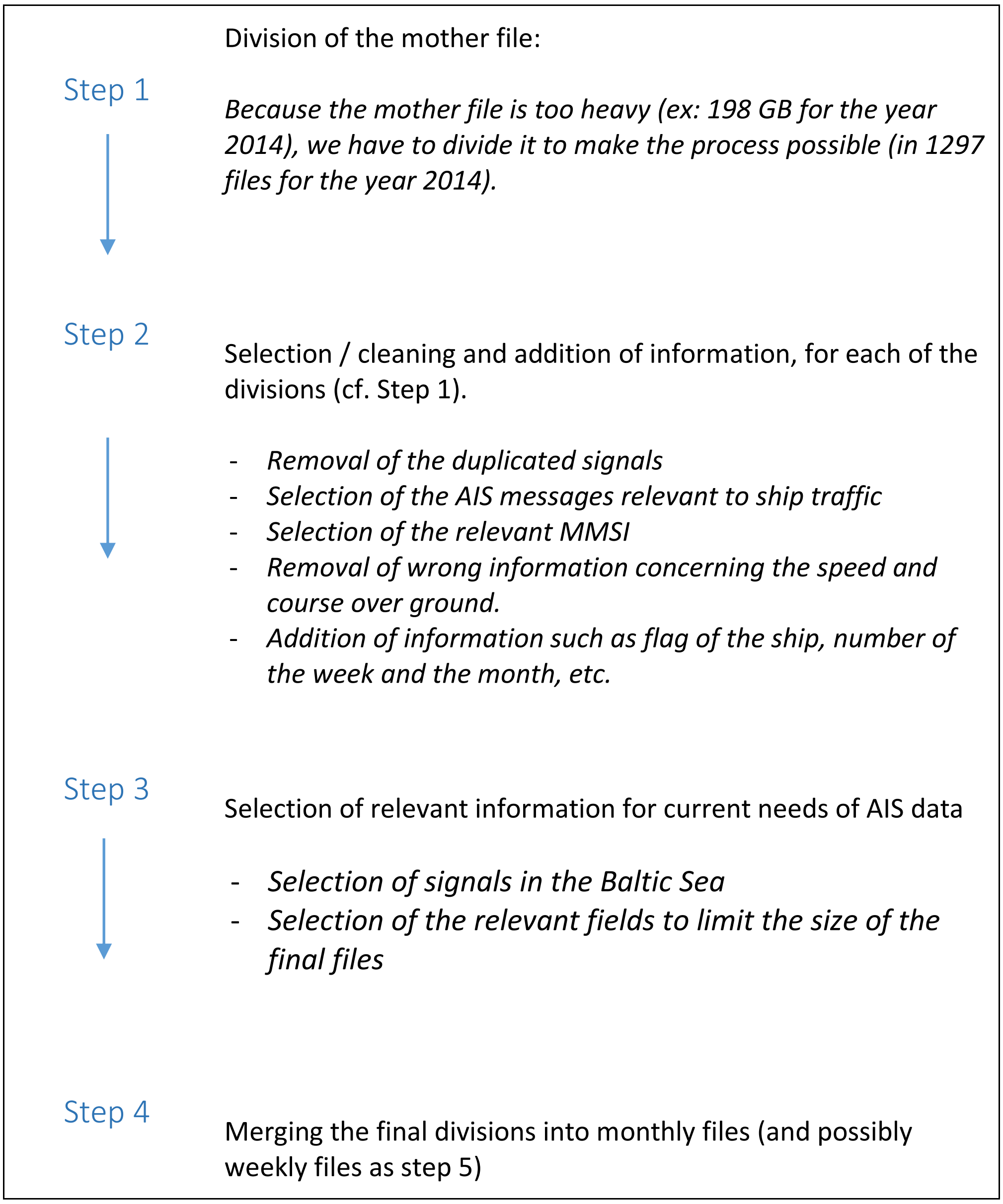
The Meeting is invited to take note of the project activities.

[DRAFT] Short description on AIS data processing

AIS Data Processing

In May 2015, the HELCOM Secretariat sent a request to the Danish Maritime Authority (DMA) hosting the HELCOM AIS database to get a copy of the AIS data stored since the creation of the HELCOM AIS network (2005). The aim is to make available the AIS data within the HELCOM Secretariat for future projects and assessments.

The AIS data is a record of signals sent from ships, land-based structures (i.e. AIS base stations) and Aid to Navigation (AtoN) equipment. The processing of AIS data is following 4 main steps using the software R:



Step 1

Division of the mother file:

Because the mother file is too heavy (ex: 198 GB for the year 2014), we have to divide it to make the process possible (in 1297 files for the year 2014).

Step 2

Selection / cleaning and addition of information, for each of the divisions (cf. Step 1).

- *Removal of the duplicated signals*
- *Selection of the AIS messages relevant to ship traffic*
- *Selection of the relevant MMSI*
- *Removal of wrong information concerning the speed and course over ground.*
- *Addition of information such as flag of the ship, number of the week and the month, etc.*

Step 3

Selection of relevant information for current needs of AIS data

- *Selection of signals in the Baltic Sea*
- *Selection of the relevant fields to limit the size of the final files*

Step 4

Merging the final divisions into monthly files (and possibly weekly files as step 5)

Fig. 1: Steps to process AIS data

For the year 2014, a total of 419 756 641 signals are used to produce ship traffic intensity maps in the Baltic Sea (all types of ship, IMO and non-IMO), and 382 491 653 signals for 2013.

Making maps

The maps are made with ArcGIS 10.2 and several scripts written in ArcPy, The data is stored and the result is saved into ESRI's File Geodatabases. We used PyScripter and IDLE as Python IDE.

We start with AIS table files divided in months.

The process for creating maps consists of five steps:

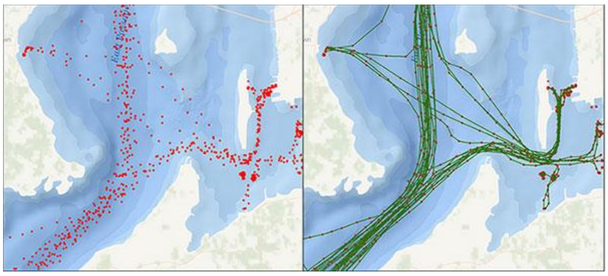
1. Make points
2. Make lines
3. Project lines
4. Make map
5. Apply symbology

1 Make points

We work with the month tables containing all AIS data processed in previous steps. We convert these tables to point layers using a stand-alone python script.

2 Make lines

After the point layers are done we convert them to lines. We use a python script called TrackBuilder made by Digital Coast, managed by NOAA's Office for Coastal Management. TrackBuilder allows to generate track lines according to date, time and identifier. It also allows users to set a distance and time filter to compensate for gaps in the data.



The result is a line file for each month.

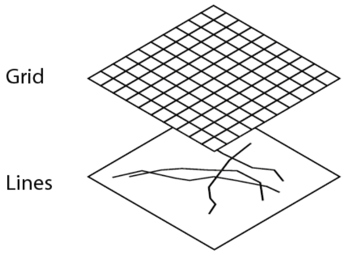
3 Project lines

After the lines are created they are projected to ETRS89 / ETRS-LAEA (Lambert azimuthal equal-area projection).

4 Make map

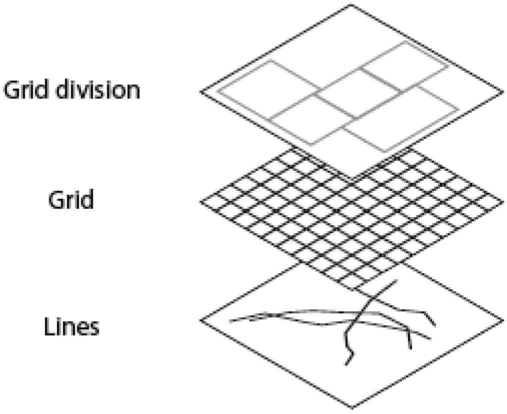
The result of this process is a map showing the number of lines crossing each cell in a INSPIRE standard grid. We use two layers:

- The line layers result of the previous process.
- A grid layer: We have used the 1km EEA reference Grid which is based on the recommendation at the 1st European Workshop on Reference Grids in 2003 and later INSPIRE geographical grid systems.



The script written in python will overlap both layer and will count how many lines are crossing each 1km cell.

In order to make the process more effective and avoid memory issues we need to divide it in five parts.

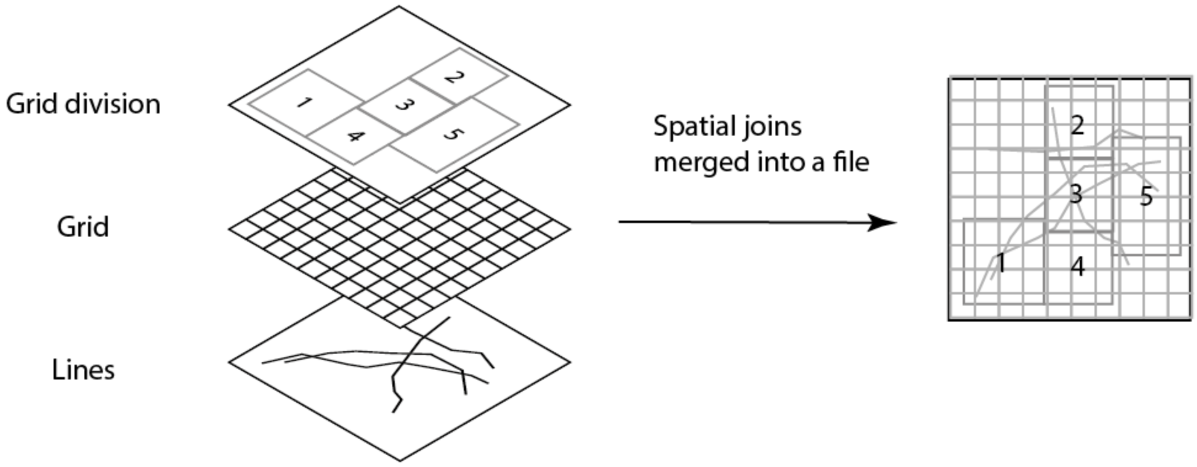


Steps for creating the map for each month file:

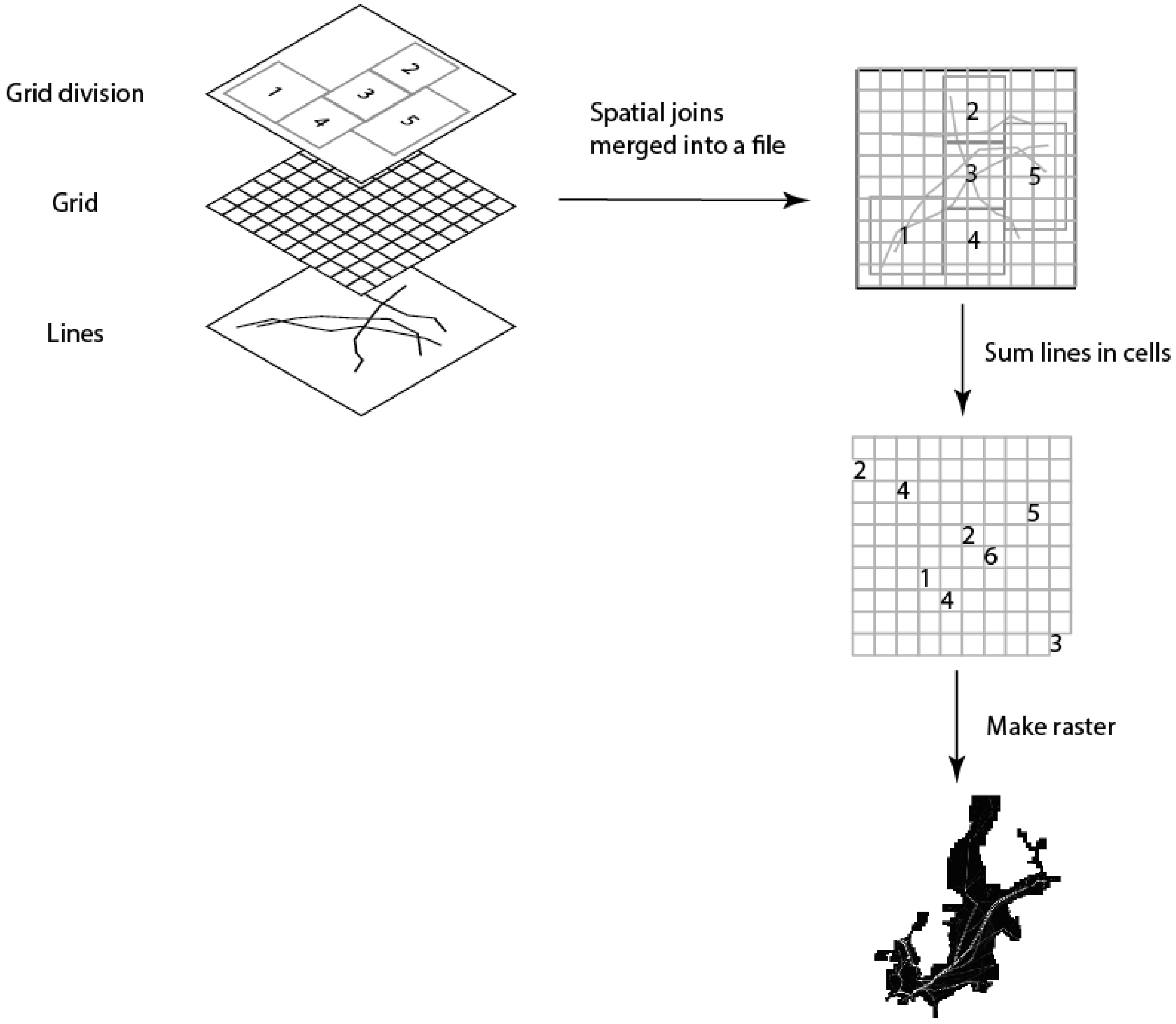
For every grid division:

- Select cells inside
- Select lines inside
- Make a spatial join to count how many lines are inside each cell

When all 5 spatial joins are made they are merged into a single file



Once we have a single monthly file containing all 5 spatial joins merged we proceed to sum how many lines are in each cell with the Dissolve tool. Finally we produce a raster file and apply symbology.


Grid division
1
2
3
4
5
Grid
Lines
Spatial joins merged into a file
2
3
5
1
4
Sum lines in cells
2
4
5
2
6
1
4
3
Make raster