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WP10 Coordinator

MEDITERRANEAN OCEAN FORECASTING SYSTEM: TOWARD ENVIRONMENTAL PREDICTION

MFSTEP

Project Deliverable Report
D5

WP10: Atmospheric Forcing and Air-Sea Interaction Studies

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1) Introduction

This report provides information about the dissemination of the meteorological forecast data that will be produced under the scopes of deliverable 5 of WP10. This work package contains the necessary activities to create and deliver the atmospheric surface fields to the WP8 and WP9 ocean modeling community, and to define and perform the Severe Verification Period (SVP) intercomparison of atmospheric models. The aim of this sub-task (deliverable 5) is to produce the meteorological forecast data using the Limited Area models and the Global model of Meteo-France and to disseminate them to the ocean modelers.

2) SKIRON/Eta Output

In the framework of the Targeted Operational Period of MFSTEP project IASA will utilize the nonhydrostatic SKIRON/Eta modeling system at high-resolution. 120-hour forecasts will be produced operationally once every week utilizing the ARPEGE fields as initial and lateral boundary conditions. The IASA/AM&WF group will make the model output available to the public through the WP10 webpage (http://forecast.uoa.gr/mfstep/) and through the project dedicated ftp server.

The model output will become available to the general public as graphics in PNG (Portable Network Graphics) format for the full computational domain. They will be accessed through the "*Forecasting Operations"* option of the MFSTEP-WP10 webpage (Figure 1). On the other hand, the raw data will be available only to the project partners in GRIB format in the dissemination domain. The computational domain is the full model domain covering the whole Mediterranean region and part of Central Europe. Initially, the dissemination domain has been defined to cover the Mediterranean Sea east of 18°E and the Black Sea (29°N-48°N, 18°E-42°E) (framed area at Figure 2). After request, the western edge of the providing data expanded to 11ºW (extended domain) covering a part of the Atlantic Ocean, the entire Mediterranean and the Black Sea in one file. Therefore the new edges of the extended domain are (29°N-48°N, 11°W-42°E). An example of an 120-hour forecast of the accumulated precipitation and the mean sea-level pressure field in the computational domain is shown in Figure 2. The black frame over Eastern Mediterranean encompasses the initially defined dissemination domain.

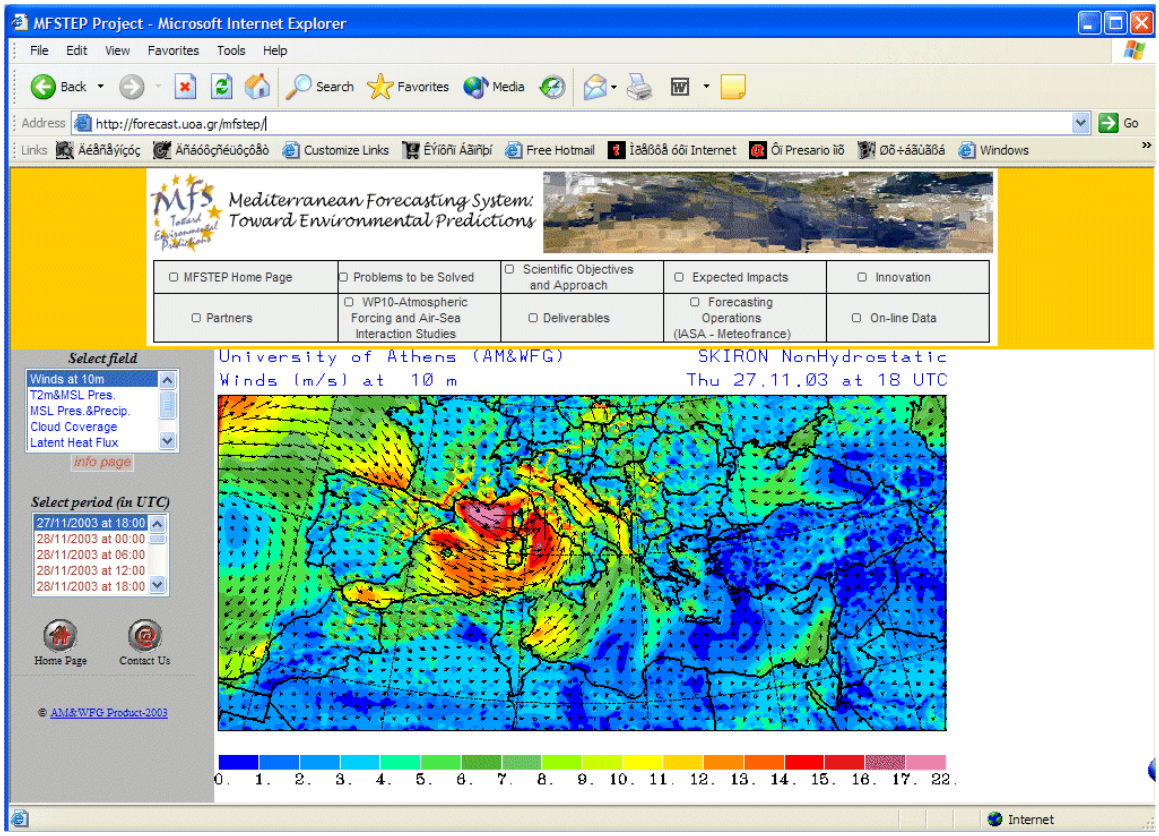

Figure 1. *The web page of MFSTEP/WP10*

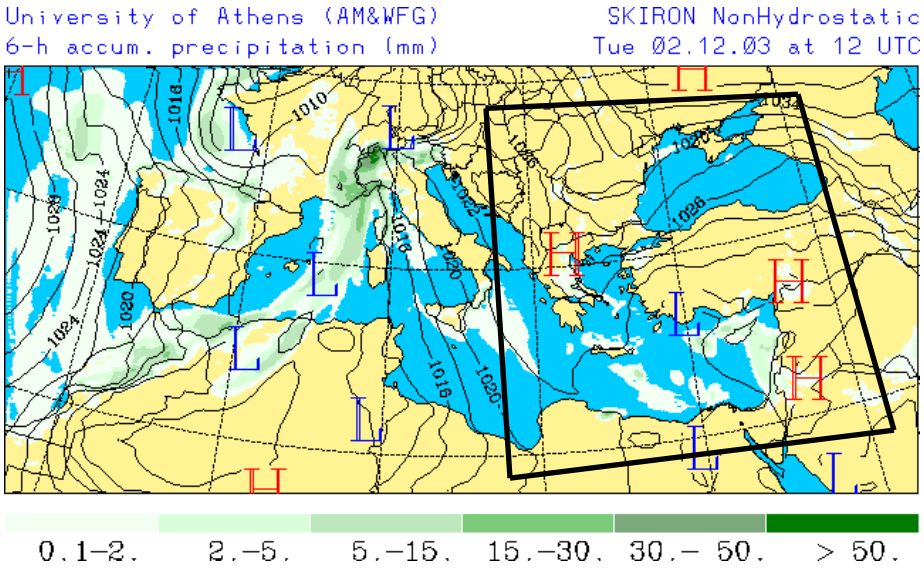

Figure 2. *120-hour forecast of the 6-hourly total accumulated precipitation and the mean sea-level pressure in the computational domain. The black frame indicates the initially defined dissemination domain. Initial time 1200UTC, 27/11/03*

The meteorological fields that will become available to the project partners in the extended domain and will be used to force the ocean models are the:

Meteorological Variables	Grib Code
u component of the 10m wind (m/s)	33
v component of the 10m wind (m/s)	34
2m Air temperature (ºK)	11
2m specific humidity (kg/kg)	51
cloud fraction (%)	71
mean sea-level pressure (Pa)	2
accumulated precipitation (kg/m^2)	61
downward shortwave radiation flux (W/m^2)	204
upward shortwave radiation flux (W/m^2)	211
downward longwave radiation flux (W/m^2)	205
upward longwave radiation flux (W/m^2)	212
Evaporation (Kg/m^2)	57
surface latent heat flux (W/m^2)	121
surface sensible heat flux (W/m^2)	122
land-sea mask (land=1, sea=0)	81
sea-surface temperature (ºK) (only analysis)	11

Table 1. *Description of the included fields in the IASA Grib encoded files.*

These fields will be available every hour up to 120 hours in regular latitude-longitude format (0.1x0.1 degrees). The accumulated precipitation will also be accumulated in hourly increments. The SST field should be used in combination with the land-sea mask field (code 81) because it is not valid over the land.

3) FTP Server of SKIRON/Eta output

The raw SKIRON/Eta output produced during TOP will be disseminated through ftp procedures and the IASA/AM&WFG web page. Standard GRIB encoding for the model output has been adopted (Table 1). IASA in cooperation with the other partners involved in the atmospheric modeling will have the responsibility to distribute their own weekly forecasts to the interested project partners.

IASA has setup an ftp server that will be dedicated to the SKIRON/Eta output. Its address is:

ftp.mg.uoa.gr (IP: 195.134.91.103)

and the interested partners can be provided with a username and a password on request.
The filename convention of the grib files will be:

MFSTEP_CENTER_TTDDMMYY_XXX.grb

where TT, DD, MM and YY are the time, date, month and year (respectively) of the initial time and XXX is the forecast time (in hours). CENTER corresponds to the originating center, e.g. MF, IASA, CHMI. For example, the file **MFSTEP_IASA_12271103_102.grb** corresponds to the 102 hours forecast of IASA from 1200 UTC, 27 November 2003. Its valid time is 1800 UTC, 1 December 2003. The forecasts will remain in the server for a week until they are replaced by the new 5-day forecast. All the forecasts of IASA will be archived. Information about any changes in the structure of the directories of the ftp server and in the available files will be provided in a frequently updated README file. Alternatively, the GRIB-files of the latest SKIRON/Eta run will also be accessed through the MFSTEP-WP10 web page by clicking on the option "On-line Data" and using the provided login and password.

4) Aladin Output

In the framework of pre-TOP and TOP, CHMI will run the Aladin model over the "Mfstep domain" covering whole Mediterranean sea, Black sea and a part of Atlantic ocean, as shown on Figure 3. SVP data have already been produced under the same conditions.

According to WP8 and WP10 requirements, data are provided in regular lat/lon grid with 0.1x0.1deg. resolution and with 1 hour output frequency.

Two dissemination domains are available:
Mediterranenan sea [-19W,37E];[30N,48N] => 561x181 points, abbreviated 'm'
Black sea [27E,42E];[40N,48N] => 151x81 points, abbreviated 'b'

The Aladin/Mfstep system is running in a permanent pseudo assimilation cycle (see WP10/D8 report for more details). The cycling is intermitent, analysis is performed every 6 hours. From each analysis a 6h forecast is produced to obtain the first guess for the next analysis step. The

main forecast (production, +72h every day in SVP and +120h once a week on Wednesday for pre-TOP and TOP) is launched from the initial conditions provided by the assimilation cycle described above.

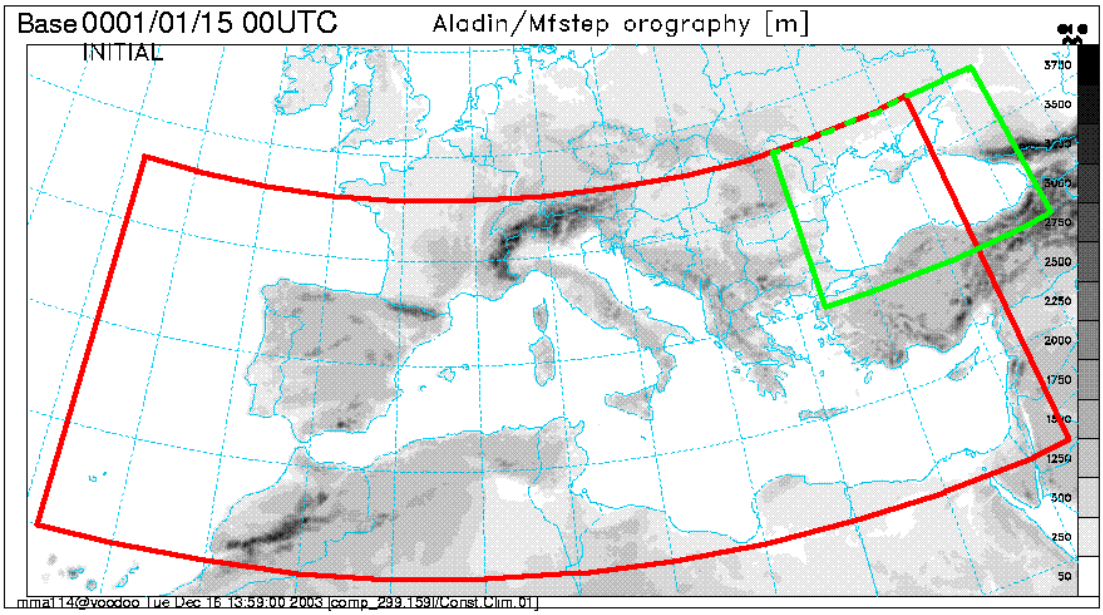

Figure 3. *The computational domain of Aladin model and the associated orography. The two color frames encompass the dissemination domains of Meteo-France and CHMI*

Data from both analysis (denoted 'a', usage of the abbreviation is described below) and production ('p') modes will be disseminated.

The meteorological fields that will become available to the project partners and will be used to force the ocean models are the:

No.	MFSTEP field	units	GRIB ID
1	land-sea mask	[0=sea, 1=land]	81
2	10m u-wind component	[m/s]	33
3	10m v-wind component	[m/s]	34
4	2m temperature	[K]	11
5	2m specific humidity	[kg/kg]	51
6	cloud coverage	[%]	71

7	mean sea level pressure	[Pa]	2
8	sea surface temperature	[K]	11
9	total accumulated precipitation	[kg/m2]	61
10	longwave down radiative flux	[W/m2]	153
11	longwave up radiative flux	[W/m2]	151
12	shortwave down radiative flux	[W/m2]	154
13	shortwave up radiative flux	[W/m2]	152
14	clear sky longwave up radiative flux	[W/m2]	155
15	clear sky longwave down radiative flux	[W/m2]	157
16	clear sky shortwave down radiative flux	[W/m2]	158
17	clear sky shortwave up radiative flux	[W/m2]	156
18	latent heat flux	[W/m2]	121
19	sensible heat flux	[W/m2]	122
20	evaporation	[kg/m2]	57

***Table 2**. Description of the included fields in the Meteo-France and CHMI Grib encoded files.*

In addition, for SVP the geopotential, temperature and wind components at 500 and 850 hPa every 6h are delivered for the purpose of the intercomparisson of the two LAM models used.

GRIB_ID follows the WMO standards except numbers 151-158 which are locally used for radiative flux components. Radiative flux components are positive quantities, and the direction of the flux should be recognized by its name (up/down). Latent heat flux and sensible heat flux are calculated positive downward, i.e. their sign is mainly negative. The same remark is valid for evaporation. All fluxes except precipitation and evaporation are of instantaneous type.
Precipitation and evaporation are accumulated within 1 hour interval, and they are therefore expressed in [mm], i.e. [kg/m2]. The fresh water flux can be obtain as the sum of those two quantities.

Note, that at the forecast range +0h there are no fluxes available (products no. 9-20). However, the +6h forecast from the previous analysis step can be used. For example, to obtain fluxes at 18 UTC on 03/01/2003 one should use the +6h forecast from 03/01/2003 12 UTC (instead of +0h forecast from 03/01/2003 18 UTC). This is of course true for both ‘a’ and ‘p’ forecast steps.

5) FTP Server of Aladin output

The Aladin/Mfstep data will be available for project partners in grib format. Due to the limited capacity of CHMI Internet connection (2Mbits per second), and thanks to kind offer of IASA to use their ftp server for Aladin data, the following proposal is made:

- SVP data will be uploaded to IASA ftp server ftp.mg.uoa.gr, directory uploads/Aladin/YYYYMMDDNT (finished on 22/12/03);
- SVP data can be also sent on DVD to interested partners if requested;
- no download of SVP data from CHMI will be possible.
- pre-TOP and TOP data will be available on ftp server of CHMI ftp.chmi.cz. User and password will be provided to project partners on request. The retention time of these data on the ftp server will probably be two days.
- However, in order not to disturb the CHMI Internet line (used also for commercial and operational products) in case when many partners would try to download these data, the pre-TOP and TOP data will be also uploaded to IASA ftp server (trying to avoid the rush traffic hours). From there the download shall be more comfortable and less problematic for the project partners. Just to remind, the total size of the grib files for both dissemination domains is about 4.05MB pre range. Thus, for 1 day of assimilation one has 28 of such files (still feasible for Internet download). But in case of +120h forecast (once per week) the total amount of data is almost 0.5GB !
- Another technical solution for a more comfortable distribution of pre-TOP and TOP Aladin/Mfstep data is being further investigated.

The naming convention follows the WP8 and WP10 proposal, slightly modified to mirror some extra specifications:

MFSTEP_CHMIdm_HHDDMMYY_XXX.grb, where

d stays for domain (hence 'b' or 'm'; see section 4)

m stays for mode (hence 'a' or 'p'; see section 4)

HHDDMMYY denotes the starting forecast time (hour day month year)

XXX is the validity range of the forecast (in hours).

For example:

MFSTEP_CHMIma_00030103_000.grb

is the analysis ("+0h forecast") from the assimilation cycle, starting (and valid) at 03/01/2003 00 UTC, post-processed to Mediterranean sea domain;

MFSTEP_CHMIma_00030103_004.grb
is the +4h forecast within the assimilation cycle, starting from 03/01/2003 00 UTC, valid at 03/01/2003 04 UTC, postprocessed to Mediterranean sea domain;

MFSTEP_CHMIbp_00030103_028.grb
is the +28h forecast in production mode, starting at 03/01/2003 00 UTC, valid at 04/01/2003 04 UTC, post-processed to Black sea domain.