

Oil Spill Forecasting System

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Sostenibilità

17 June 2020

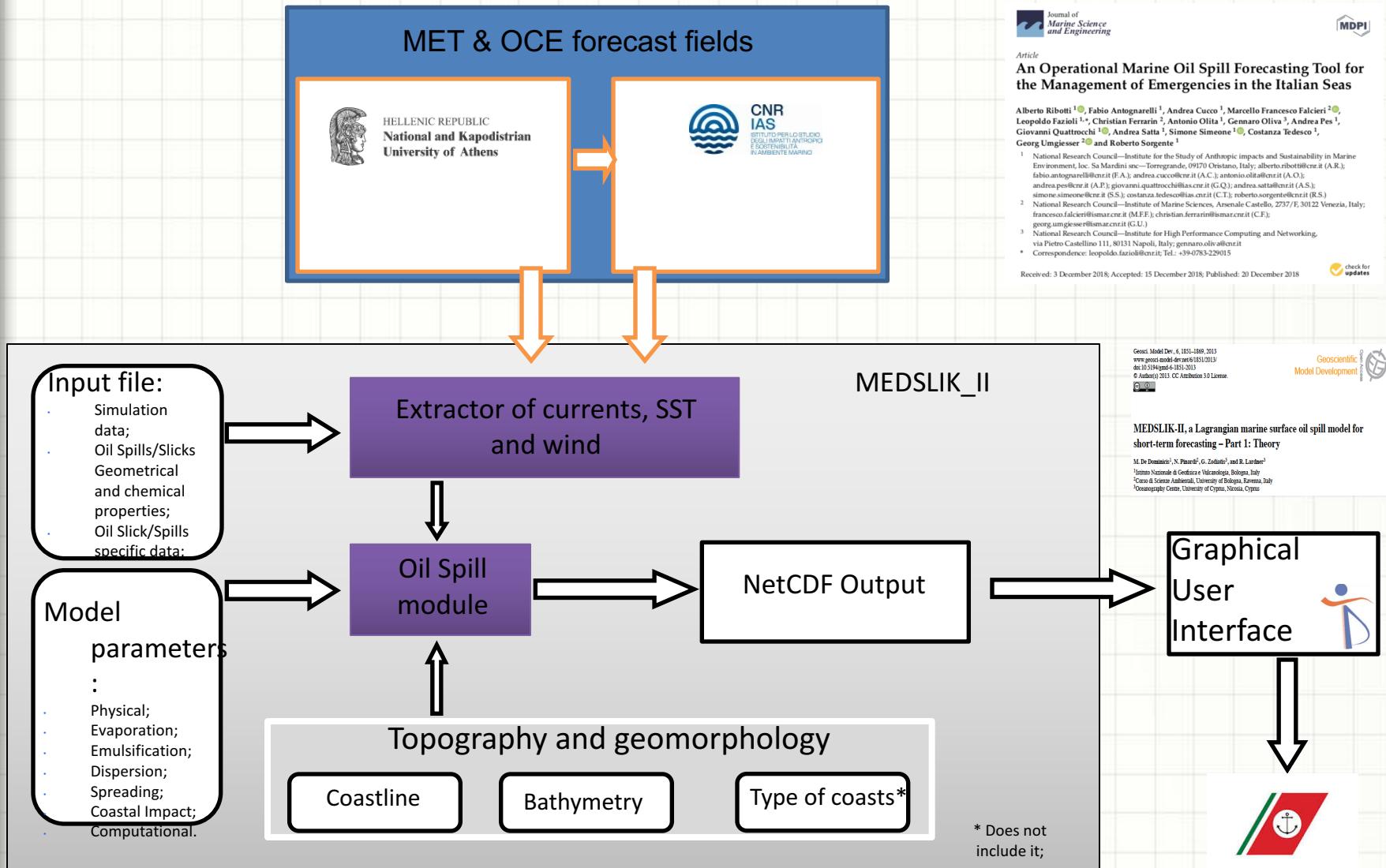


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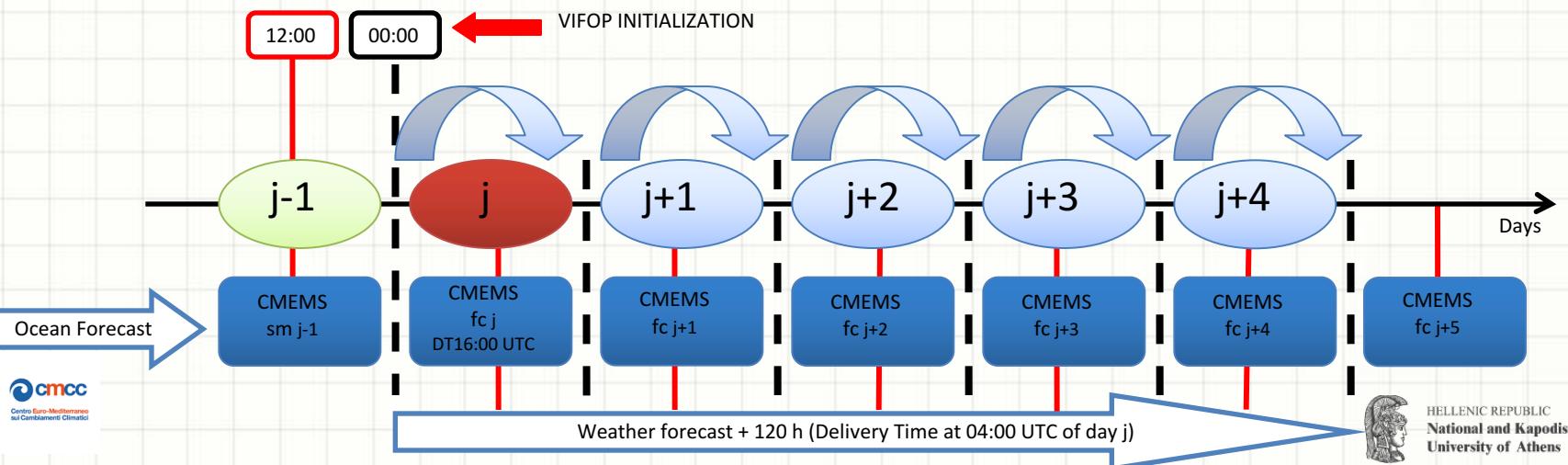
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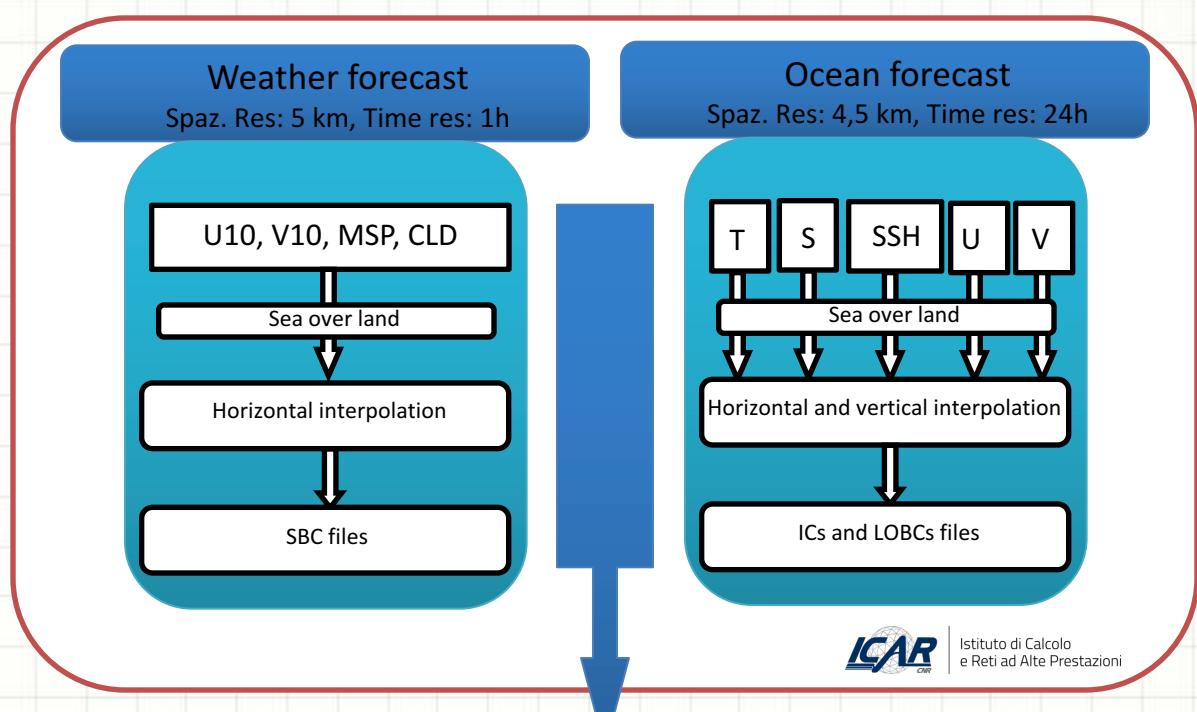
COUPLING MEDSLIK-II to OCEAN FORECAST SUB-REGIONAL MODELS



THE OPERATIONAL CHAIN

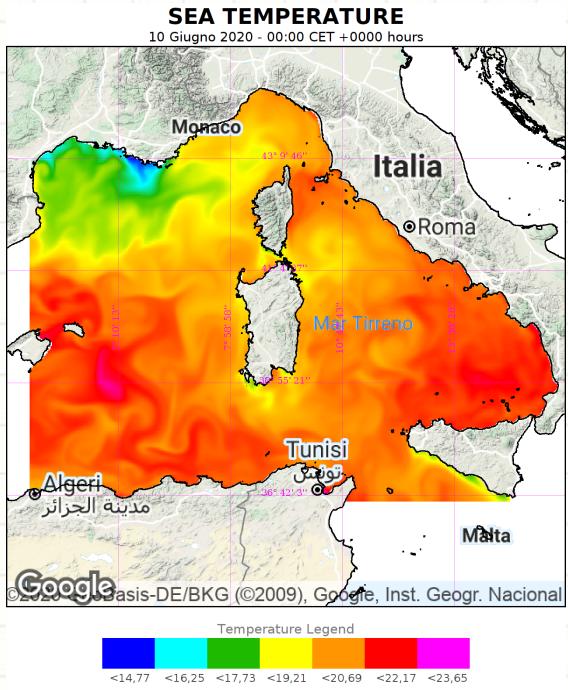


Daily forecast cycle



Western Mediterranean Sea and Sicily Channel Sub-Regional Forecasting Systems

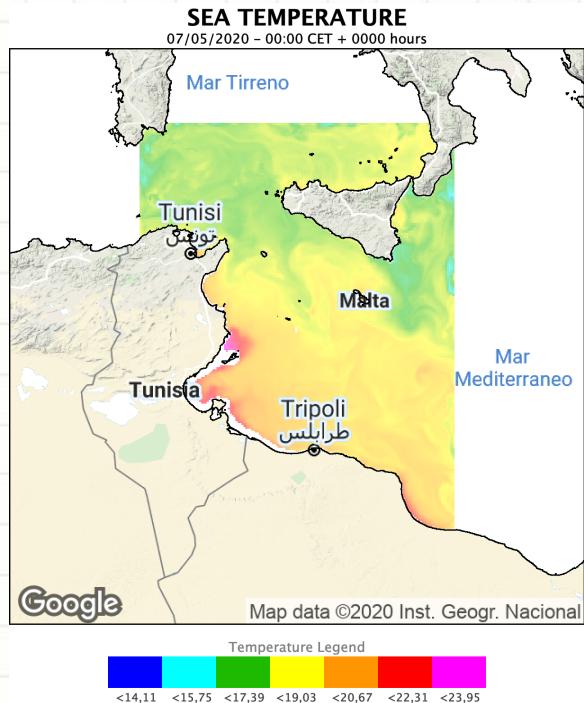
WMED-6041
Spaz. Res: 1/60°, Time res: 1h



**5-day forecast
(hourly and daily mean)**

- Elevation
- Temperature
- Salinity
- Velocity

SCRM-6041
Spaz. Res: 1/60°, Time res: 1h



What have we done?

1) Correction of the Evaporation rate bug

$$f = p_{oil} \cdot E \rightarrow \text{fraction of evaporated oil}$$

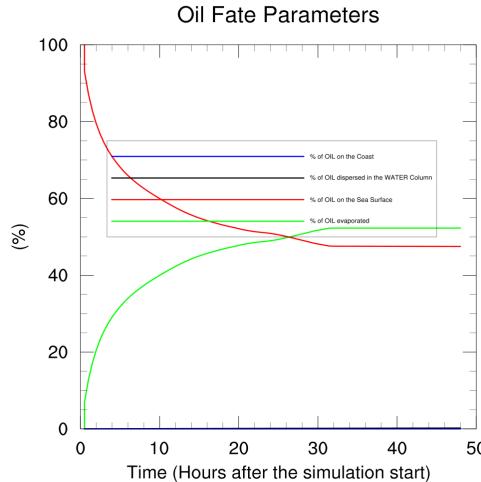
$$K_m = C_1 \cdot U^{0.78} \cdot X^{-0.11} \rightarrow \text{mass transfer coeff.}$$

$$\begin{aligned} & \xrightarrow{\hspace{1cm}} p_{oil} = p_0 \cdot e^{-C_f} \rightarrow \text{vapor pressure of the liquid (}p_0=\text{initial value)} \\ & \boxed{E = \frac{K_m}{RT_0} \frac{A v t}{V}} \rightarrow \text{evaporative exposure} \\ & \xrightarrow{\hspace{1cm}} \text{gamma (Sutton, 1963; Mackay&Matsugu ,1973)} \end{aligned}$$

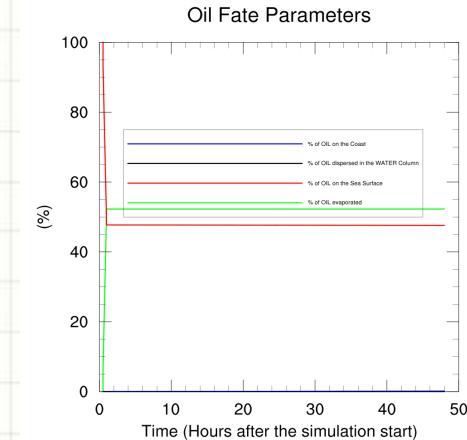
The same name variable was used into the stoke drift calculation JONSWAP SPECTRUM
(Gamma was always =3.3):

SOLUTION:

We introduced a new variable (**gamma_evap=0.78**)



After the correction the Evaporation curve (green) is correctly reproduced and now it may be possible to know the estimated time to reach the saturation. As a consequence the '% Oil on the surface' is corrected too (red curve)



The fortran code

```
236 c-----  
237 c evaporation constants from Mackay et al.  
238 c ce=coeff accounts for drop in vapour pressure with evaporation (ce=10-20)  
239 c ce1=akew*(wvel*3.6)*gamma_evap = evaporative exposure to wind  
240 c visk = coeff for change of viscosity with evaporation  
241 c-----  
242 read(39,*),empty  
243 read(39,*),ce ! 12.0  
244 read(39,*),akew ! 0.00033  
245 read(39,*),gamma_evap ! 0.78  
246 read(39,*),visk ! 4.  
247 c-----  
258 c-----  
259 ce1=akew*(wvel*3.6d0)*gamma_evap  
260 c print *, 'gamma_evap', gamma_evap  
261 c print *, 'gamma', gamma  
262 c m1 = x0 + 0.5  
263 c n1 = y0 + 0.5  
264 c write(90,*),m1,n1  
265 c write(90,*),timehr,winx(m1,n1),winy(m1,n1),wvel,wdx
```

What have we done?

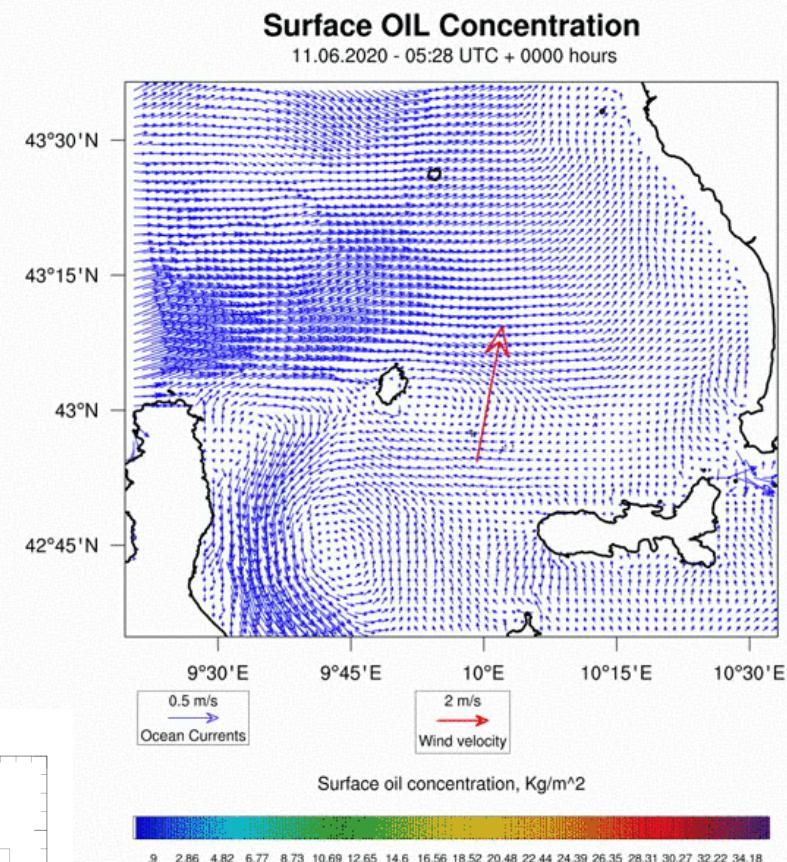
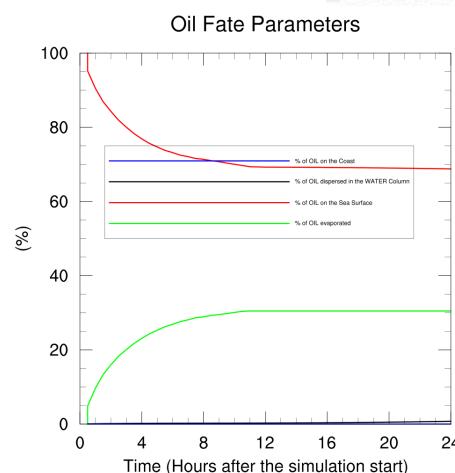
2) Multiple slick (in progress)

Multiple areal source of spill.

An example:

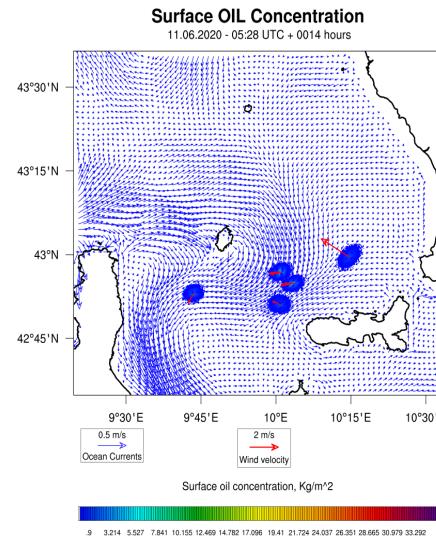
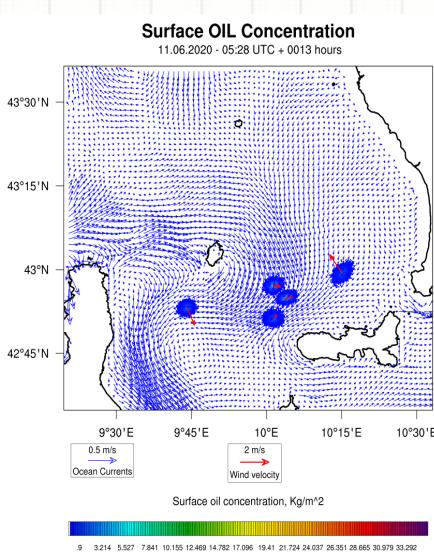
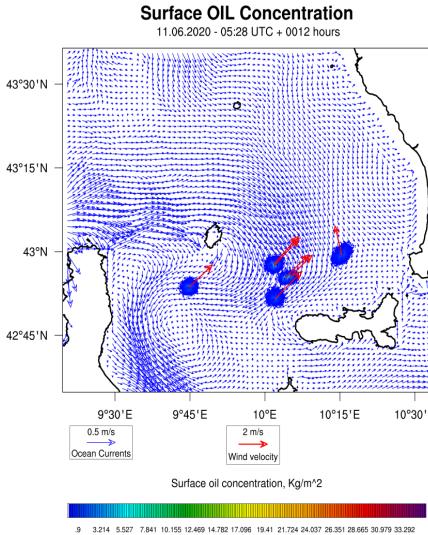
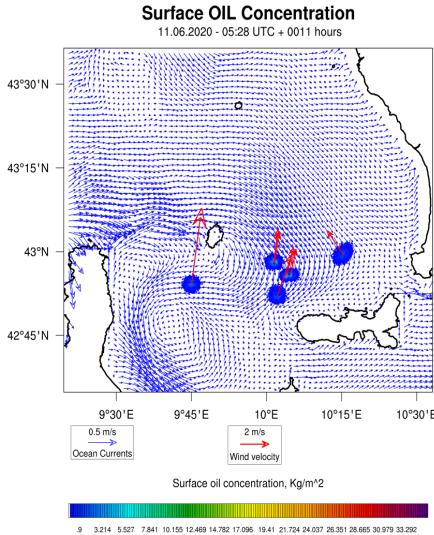
```
NSLICK=5
SAT_DATA=NO      # SATELLITE DATA; for Point Sources choose NO
NAMEFILE_GML=    # if you have selected SAT_DATA=YES fill this section, otherwise leave it blank.
CONTOURSLICK=YES # MANUALLY INSERTION OF SLICK CONTOUR; for Point Sources choose NO
OIL=API
OIL_TYPE=22.3043478261
AGE=0

#-----#
# OIL SLICKS/SPILLS SPECIFIC DATA:
#
# It consists of a list of the N oil slicks/spills
# ordered from the nearest to the farthest in time
# to the time start of the simulation.
#
# For each Nth oil slicks/spills it is needed to specify:
#
# - date of the Nth(n) slick observation/oil released:
#   day      (SnDD)
#   month    (SnMM)
#   year     (SnYY)
# - time of the Nth(n) slick observation/oil released:
#   hour     (SnHR)
#   minutes  (SnMN)
# - spill duration of the Nth(n) slick/spill, in hours:
#   if the spill is instantaneous or it is an observed
#   slick type 0
#   (SnDurath)
# - spill rate in tons/hours of the Nth(n) slick/slick:
#   if the spill is instantaneous or it is an observed
#   slick write the total tons spilled
#   (SnSplrt)
# - Longitude and latitude (in decimal degree) of the
#   Nth(n) slick/spill:
#   (Snlon[k])
#   (Snlat[k])
#
# for point sources spill, write the
# coordinates of the Nth point (k=1)
#
# for polygon slicks, write the coordinates
# for each of kth(k) corner of the Nth slick
#-----#
```



What have we done?

2) Multiple slick (in progress)



...some snapshots
of the multislick
simulation
where it is visible
that the wind is
related to n-th
slick

What have we done?

3) GUI for Italian Coast Guard (SOS-Piattaforme project, MATTM)
D. Laguardia, M. Arrigo, A. Signa (ITD/CNR, Palermo)

- Set Input Parameter
- Configure Physical Parameter
- Configure Weathering Parameter
- Configure Control Parameter
- Configure Computational Parameter
- Start a Simulation

SOSPiattaforme [Home](#) [Simulazione](#) [Impatto](#) [Rischio](#) [SAR](#) [Gestione](#) [Documentazione](#) admin Italiano

Simulazione

DATI INPUT RISULTATI DELLA SIMULAZIONE

SIMULAZIONE

Nome Simulazione:	Test	Durata Simulazione (h):	24			
Tipo Sversamento:	Versamento Puntuale					
Lista Piattaforme	Latitudine	Longitudine	Data (UTC)	Sversamento (tons/h)	Durata (h)	Volume (tons)
SCEGLI	-	-	12/06/2020 13 PM	0	0	0

PARAMETRI

Chimici Fisici Weathering Computazionali Controllo

Classe dell'Olio: Light
Nome dell'Olio: Default Light

Proprietà Olio Default Light	
*API	38.4
Densità Olio	0.833
Densità Residuo Olio	0.894
Percentuale Residuo Olio	48.91
Viscosità Olio	2.9
Temperatura alla quale la viscosità è determinata	38.0
Pressione del Vapore dell'Olio	0.412

RIEPILOGO SIMULAZIONE

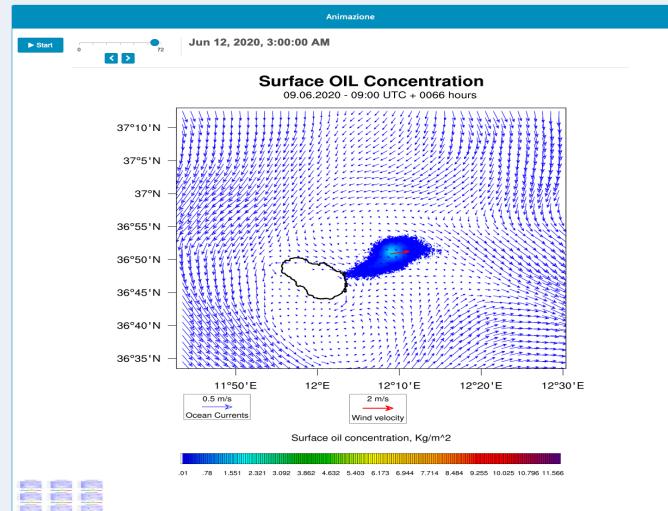
Nome Simulazione: Test
Durata Simulazione (h): 24
Previsioni correnti marine: Sistema Previsione Assente
Previsioni meteo: Skiron
Previsioni onde: None
*API: 38.4
Stokes drift: Calcolato con Jonswap
Wind correction: No
Depth of thermocline: 30.0

MAPPA

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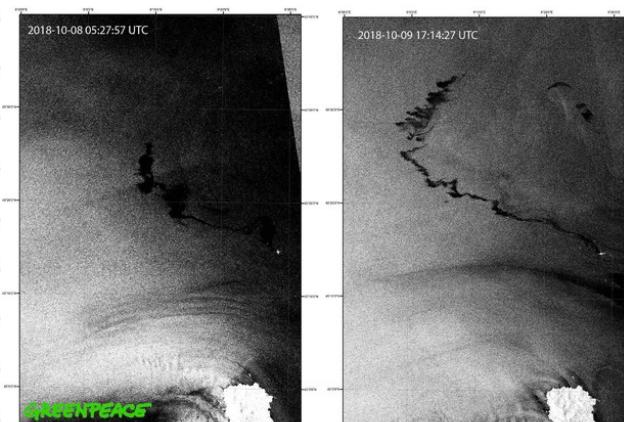
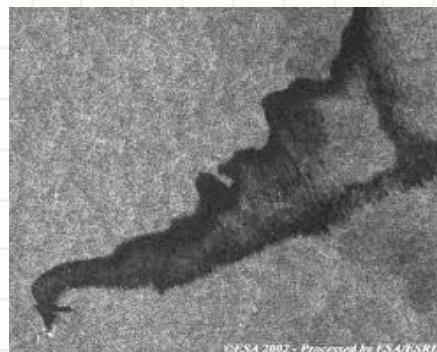
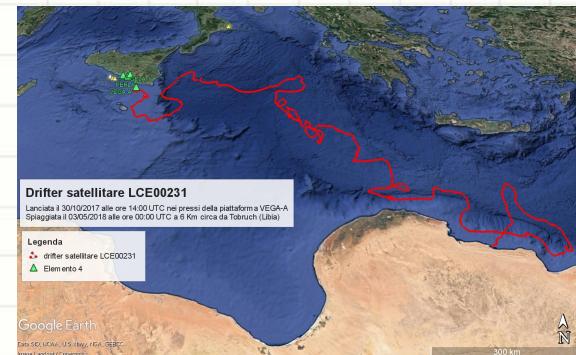
Avvia Simulazione

GUI (Gallery)



Next contributions to the workplan (2020-2022):

- Sensitivity of weathering parameterization to meteo-oceanographic conditions and to °API;
- Drifter model validation;
- Areal source of spill from satellite data





THANK YOU