



Ukrainian Hydrometeorological Center  
State Service on Emergency of Ukraine



# Comparison of calculation results performed by the WMO(RSMCs) and RACPC during the ConvEx-3 exercise in 2021

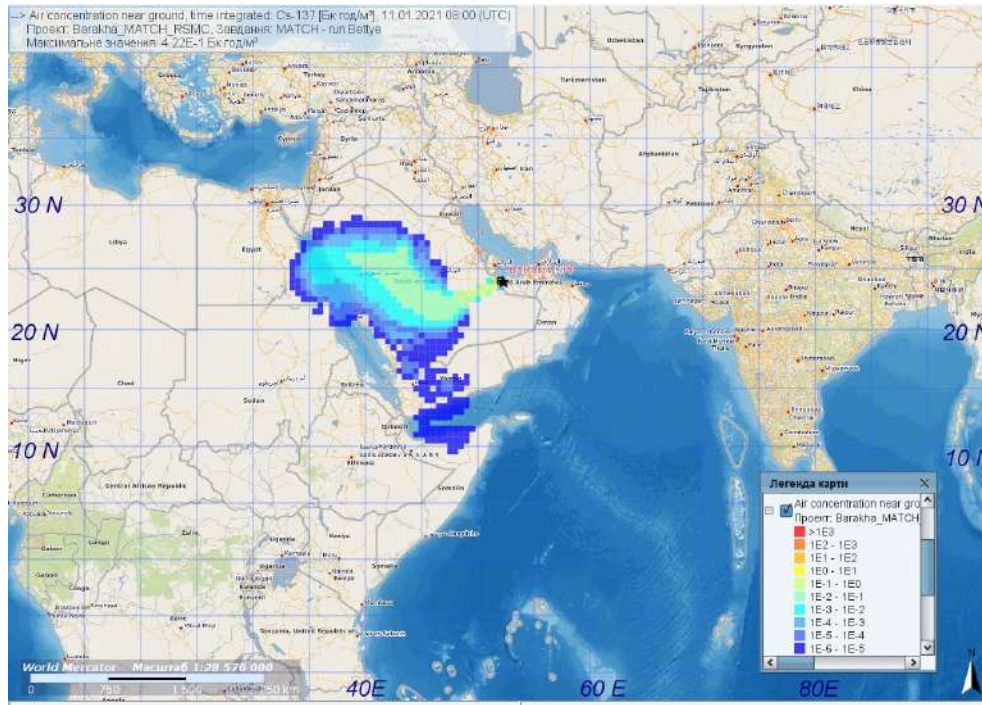
*Radiation Accidents Consequences Prediction Center  
(RACPC)*

*I. Kokot, L. Tabachnyi*

KIT RUG , 25th January 2022

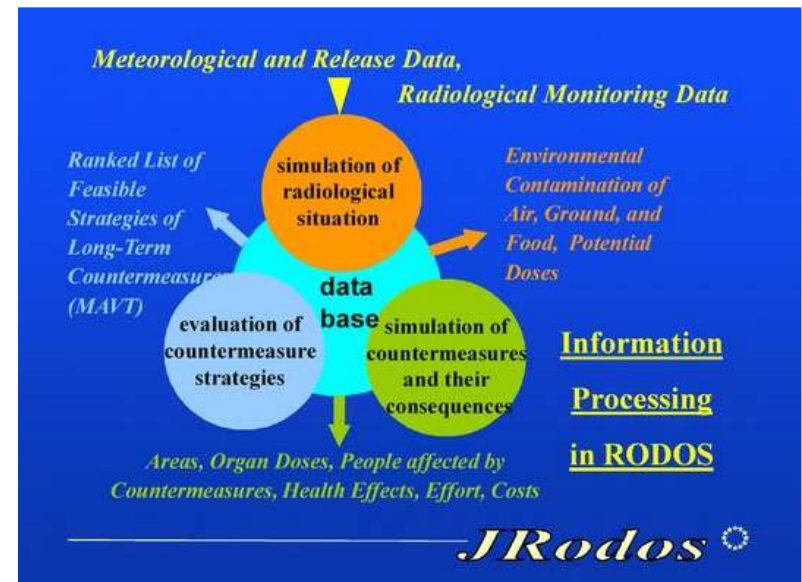
# Radiation Accidents Consequences Prediction Center

The center was established with the financial and organizational support of the European Commission in 2015.



The center is in charge to collect, collate, analysis and exchange information on the actual and expected radiation situation on the territory of Ukraine in cooperation with Hydrometeorological institutions.

RACPC acting as a structural unit of Ukrainian Hydrometeorological Center and is an integral part of the Emergency Response System of the State Service on Emergency of Ukraine. The center operates with JRODOS and is the main information support center for decision-making in cases of Emergency.



# Input data for simulation

Source location : 52.2317E ; 23.9678 N Unit : Barakha NPP

Start emission : 07:45 (UTC) 26/10/2021 ; End emission: 10:45(UTC)26/10/2021; Duration: 3h

Total emission : 2,1e+11 Bq ; Rate : 1,94444e+07 Bq\*s for RSMC Exeter, RSMC Obninsk, RSMC Tokyo

Total emission : 2,15e+11 Bq ; Rate : 1,99+07 Bq\*s for RACPC

Rate : 0,7+07 Bq\*h for RSMC BeiJing

Height : 39 m agl ; Pollutant: Caesium-137

Meteo for the exercise: historical meteorological conditions (8 and 9 January 2021)

## Table of comparisons

Calculation performed by	Dispersion model	Meteo	Air Concentration near ground Cs-137 [Bq*s/m3].					
			24h Time integrated		24h Time integrated after the first day of the emergency		24h Time integrated after the second day of the emergency	
			Maximum value	Location of max value	Maximum value	Location of max value	Maximum value	Location of max value
RACPC	MATCH	NOMADS	1,52E+03	52,07E; 24,0N	2,13E+02	46,44E; 21,9N	1,00E+02	40,5E; 25,5N
RSMC Exeter	NAME	Met Office	3,70E+02	52,0E; 24,0N	1,57E+02	46,8E; 21,1N	4,42E+01	41,0E; 25,0N
RSMC Obninsk	Obninsk	OMD	1,70E+03	not specified	8,50E+01	not specified	1,70E+01	not specified
RSMC Tokyo	GTTM	JMA	5,12E+02	not specified	9,64E+00	not specified	1,94E+00	not specified
RSMC BeiJing	HYSPLIT(?)	GRAG Meteorological data	2,10E+07	51,0E; 24,0N	1,20E+07	49,0E; 21,0N	1,30E+06	46,0E; 20,0N

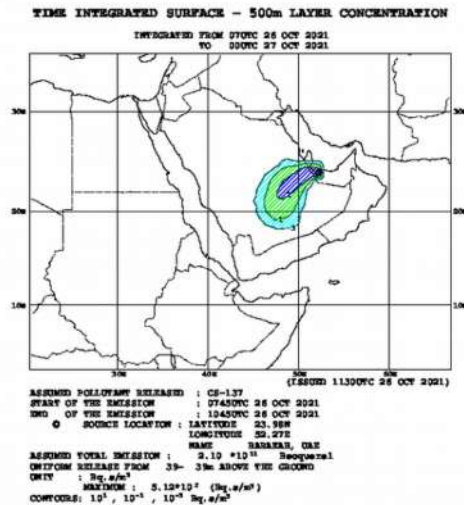
Calculation performed by	Dispersion model	Meteo	Total Depositions at ground level Cs-137 [Bq/m2].					
			24h Time integrated		48h Time integrated		72h Time integrated	
			Maximum value	Location of max value	Maximum value	Location of max value	Maximum value	Location of max value
RACPC	MATCH	NOMADS	1,31E+00	50,96E ; 23,53N	1,73E+00	42,01E ; 25,45N	1,83e+00	41.97E ; 25,53N
RSMC Exeter	NAME	Met Office	1,32E-01	50,5E ; 23,5N	3,03E-01	42,5E ; 22,0N	7,47E-01	41.5 E ; 25,8N
RSMC Obninsk	Obninsk	OMD	1,1e+01	not specified	1,1e+01	not specified	1,1e+01	not specified
RSMC Tokyo	GTTM	JMA	2,52E+01	not specified	2,52E+01	not specified	2,52E+01	not specified
RSMC BeiJing	HYSPLIT(?)	GRAG Meteorological data	not specified	not specified	not specified	not specified	2,50E+05	51,0E; 24,0N

# Air Concentration 24h time integrated. Valid from 00:00 26/10/21 to 08:00 27/10/21

RSMC Tokyo Meteorological Data Report

Air Concentration 26 October – 27 October 2021

## EXERCISE-EXERCISE-EXERCISE



## Maximum value

[Bq\*s/m3]

RACPC -  $1.52 \times 10^3$   
RSMC Exeter -  $3.7 \times 10^2$   
RSMC Tokyo-  $5.2 \times 10^2$   
RSMC Obninsk- $1.7 \times 10^3$

## Location of Max value

RACPC - 52,07E; 24,0N  
RSMC Exeter - 52,0E; 24,0N  
RSMC Tokyo- not specified  
Rsmc Obninsk-not specified

## Contour of minimum value for visualization

RACPC -  $1.0 \times 10^{-1}$   
RSMC Exeter -  $1.0 \times 10^{-1}$   
RSMC Tokyo-  $1.0 \times 10^{-3}$   
Rsmc Obninsk-  $1.0 \times 10^{-1}$

Met Office

Issuing Centre: Met Office  
Dispersion Model: NAME

### Release Data

Location: 52.2317E 23.9678N  
Start: 0745UTC 26/10/2021  
End: 1045UTC 26/10/2021  
Rate:  $1.944444 \times 10^8$  Bq/s  
Height: 39.000 to 39.000m agl  
Pollutant: CAESIUM-137

Run time: 0819UTC 13/03/2021

Results based on default initial values

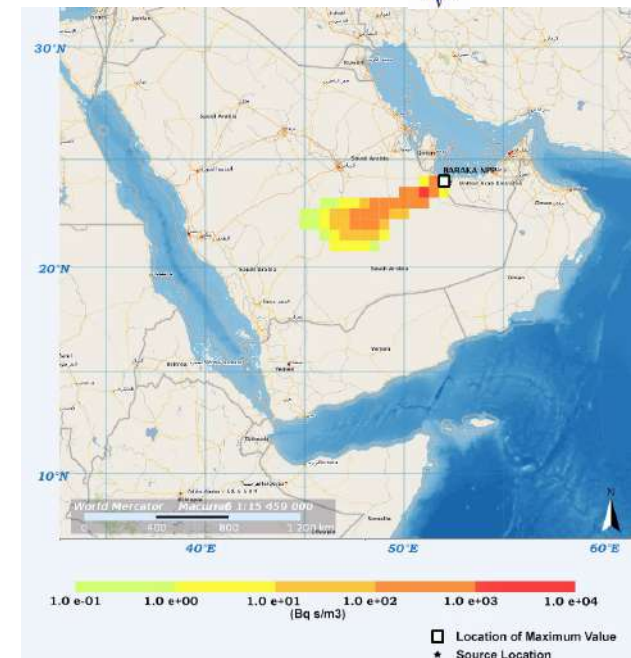
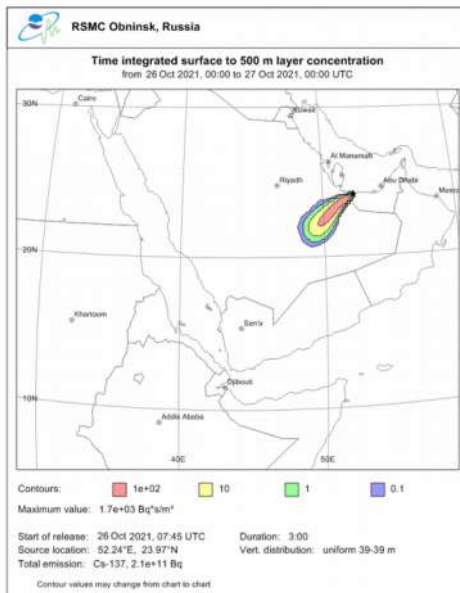
Contour values may change from chart to chart

Maximum Value =  $3.701 \times 10^2$  Bq s/m<sup>3</sup>

■ Source Location  
★ Location of Maximum Value



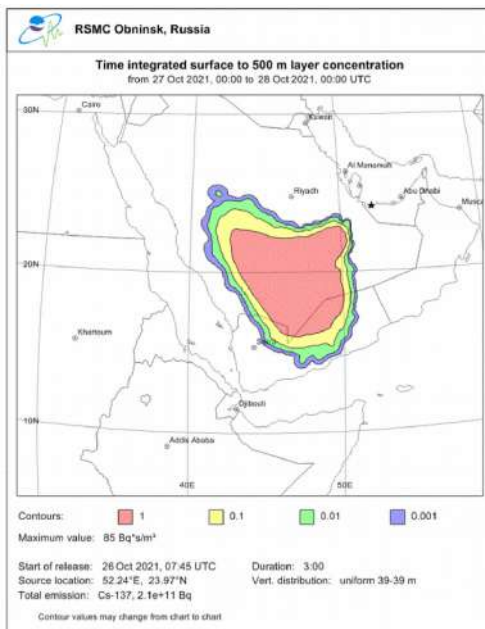
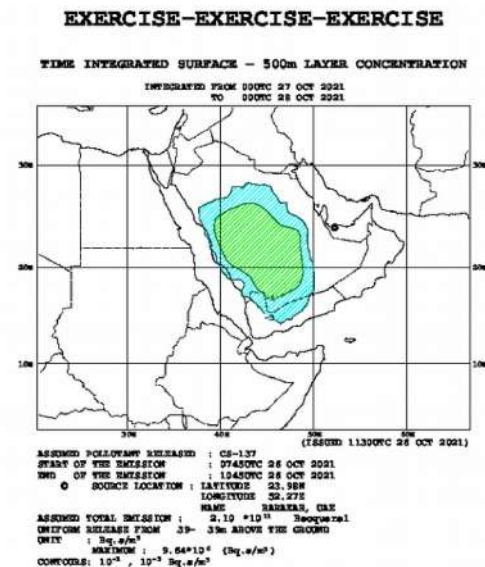
RACPC UHMC





# Air Concentration 24h time integrated. Valid from 08:00 27/10/21 to 08:00 28/10/21

RSMC Tokyo Meteorological Data Report  
Air Concentration 27 oktober-28 oktober 2021



Maximum value [Bq\*s/m3]

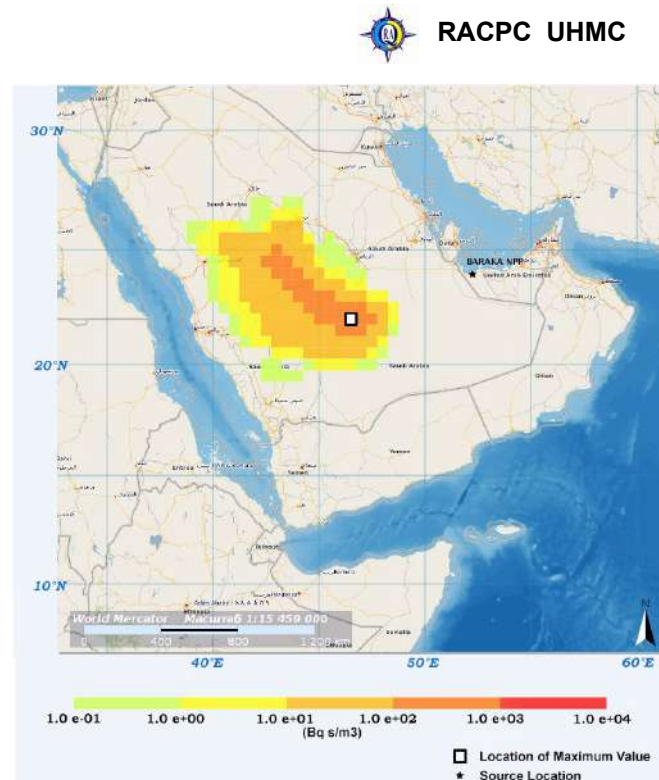
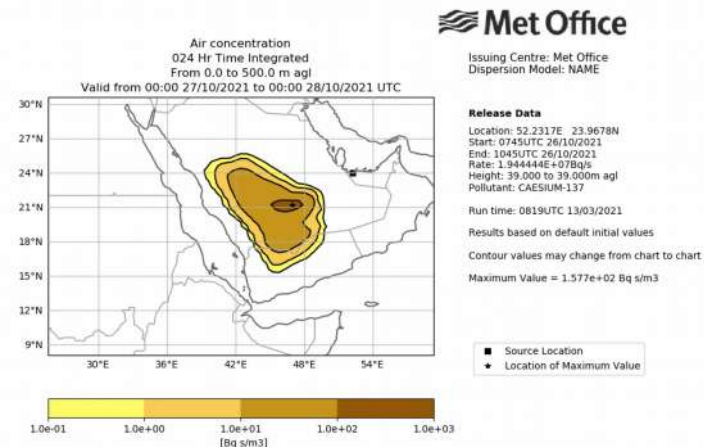
RACPC -  $2.13 \times 10^2$   
RSMC Exeter -  $1.57 \times 10^2$   
RSMC Tokyo-  $9.64 \times 10^0$   
RSMC Obninsk-  $8.50 \times 10^1$

Location of Max value

RACPC - 46,44E; 21,9N  
RSMC Exeter - 46,8E; 21,1N  
RSMC Tokyo- not specified  
Rsmc Obninsk-not specified

Contour of minimum  
value for visualization

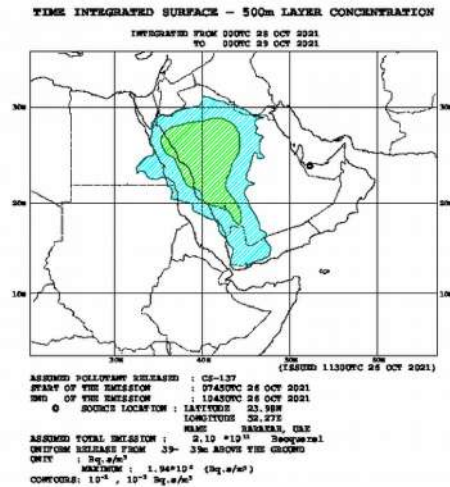
RACPC -  $1.0 \times 10^{-1}$   
RSMC Exeter -  $1.0 \times 10^{-1}$   
RSMC Tokyo-  $1.0 \times 10^{-3}$   
Rsmc Obninsk-  $1.0 \times 10^{-3}$



# Air Concentration 24h time integrated. Valid from 08:00 28/10/21 to 08:00 29/10/21

## RSMC Tokyo Meteorological Data Report Air Concentration 28oktober-29 oktober 2021

### EXERCISE-EXERCISE-EXERCISE

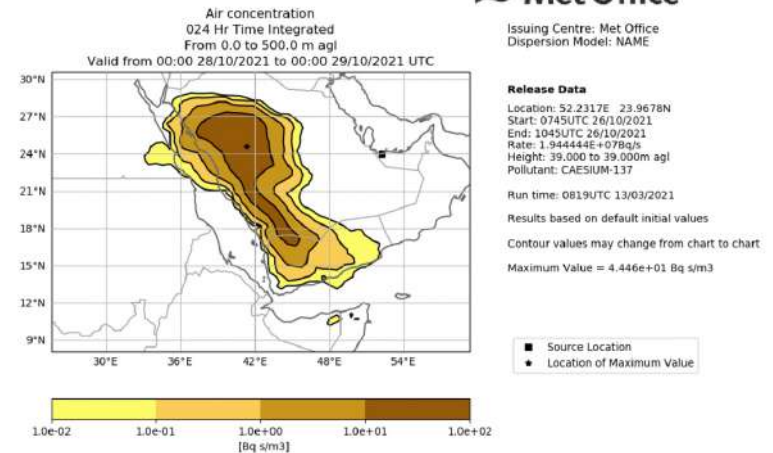


### Maximum value [Bq\*s/m<sup>3</sup>]

RACPC - 1,00 e+02  
RSMC Exeter - 4.42 e+01  
RSMC Tokyo- 1,94 e+00  
RSMC Obninsk-1,7 e+01



Issuing Centre: Met Office  
Dispersion Model: NAME



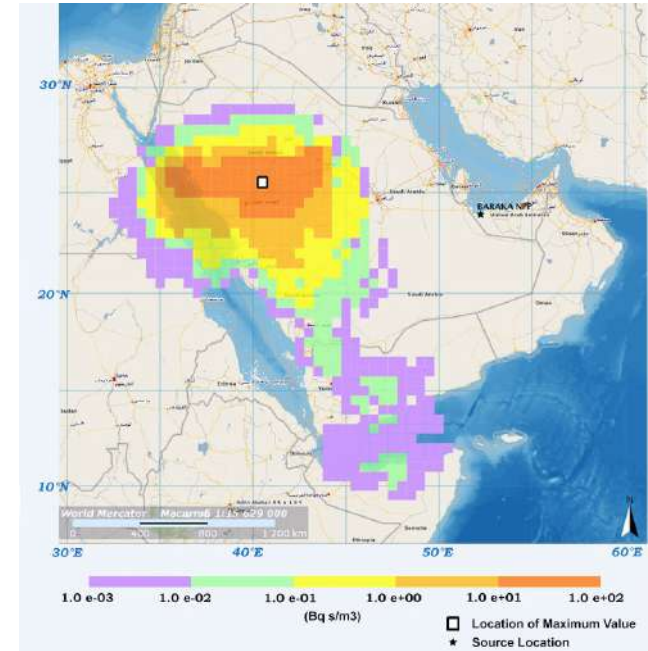
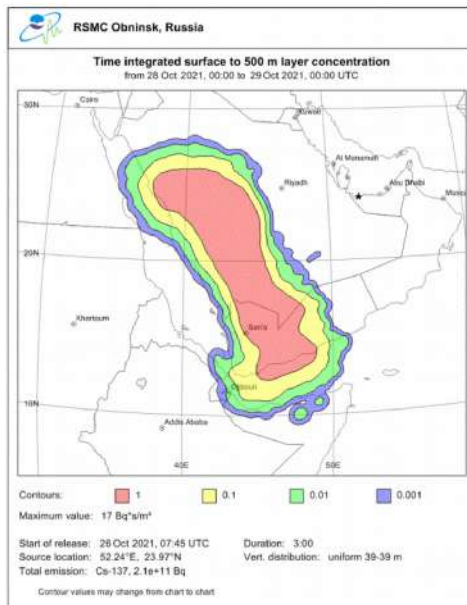
RACPC UHMC

### Location of Max value

RACPC - 40,5E; 25,5N  
RSMC Exeter - 41,0E; 25,0N  
RSMC Tokyo- not specified  
Rsmc Obninsk-not specified

### Contour of minimum value for visualization

RACPC - 1,0 e-03  
RSMC Exeter - 1,0 e-02  
RSMC Tokyo- 1,0 e-03  
Rsmc Obninsk- 1,0 e-03



# Total deposition 24h time integrated. Valid from 08:00 26/10/21 to 08:00 27/10/21

RSMC Tokyo Meteorological Data Report  
Total Deposition 26oktober-27 oktober 2021

## EXERCISE-EXERCISE-EXERCISE



Issuing Centre: Met Office  
Dispersion Model: NAME

### Release Data

Location: 52.2317E 23.9678N  
Start: 0745UTC 26/10/2021  
End: 1045UTC 26/10/2021  
Rate: 1.944444E+07Bq/s  
Height: 39.000 to 39.000m agl  
Pollutant: CAESIUM-137

Run time: 0819UTC 13/03/2021

Results based on default initial values

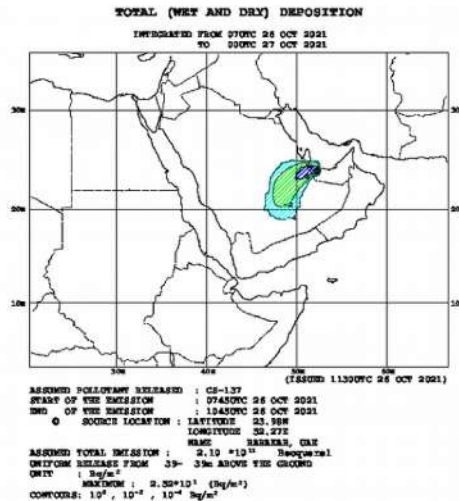
Contour values may change from chart to chart

Maximum Value = 1.323e-01 Bq/m2

■ Source Location  
● Location of Maximum Value

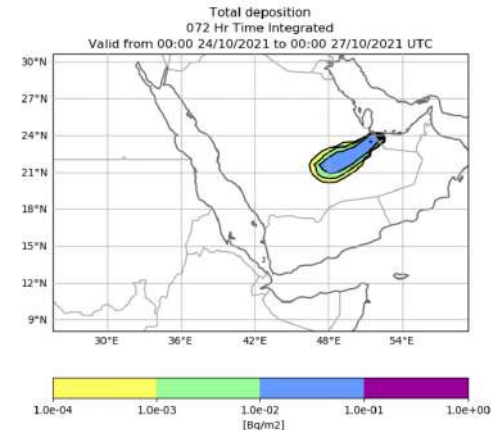


RACPC UHMC



## Maximum value [Bq/m2]

RACPC - 1,31 e+00  
RSMC Exeter - 1.323 e-01  
RSMC Tokyo- 2,52E+01  
RSMC Obninsk-1,1e+01

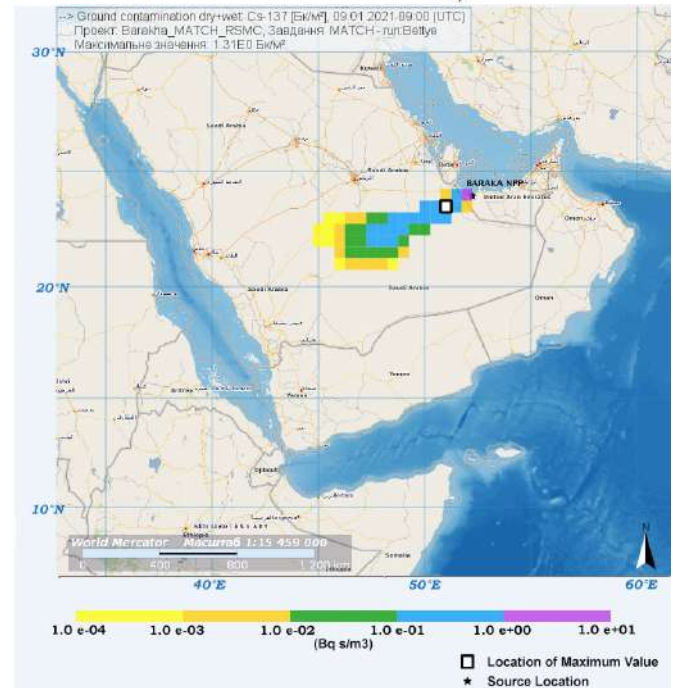
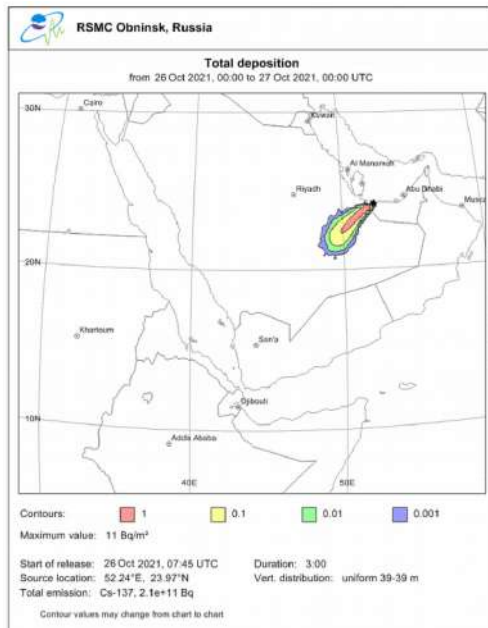


## Location of Max value

RACPC - 50,96E ; 23,53N  
RSMC Exeter -50,5E ; 23,5N  
RSMC Tokyo- not specified  
Rsmc Obninsk-not specified

## Contour of minimum value for visualization

RACPC - 1,0 e-04  
RSMC Exeter - 1,0 e-04  
RSMC Tokyo- 1,0 e-04  
Rsmc Obninsk- 1,0 e-03

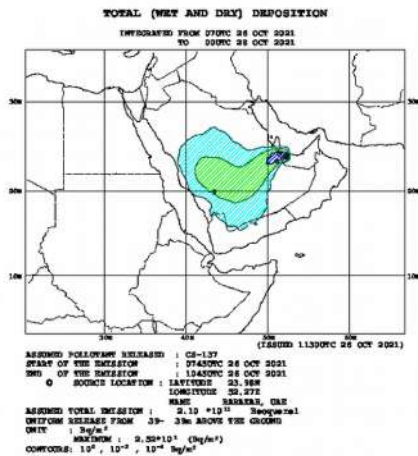




# Total deposition 48h time integrated. Valid from 08:00 26/10/21 to 08:00 28/10/21

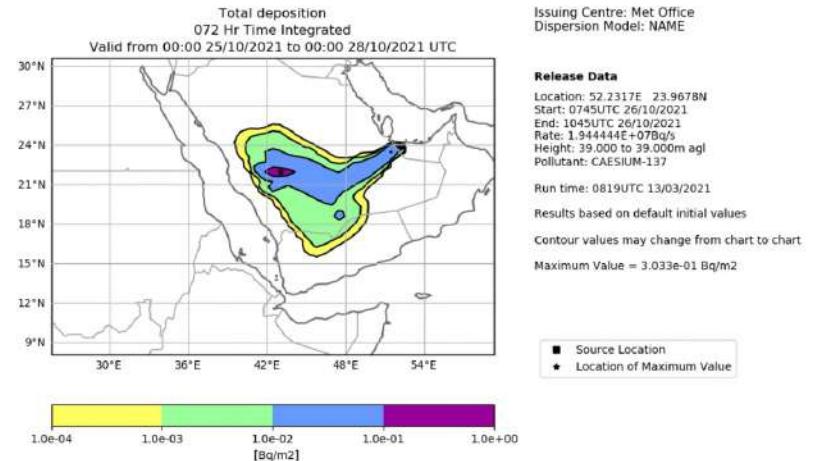
RSMC Tokyo Meteorological Data Report  
Total Deposition 26oktober-28 oktober 2021

## EXERCISE-EXERCISE-EXERCISE

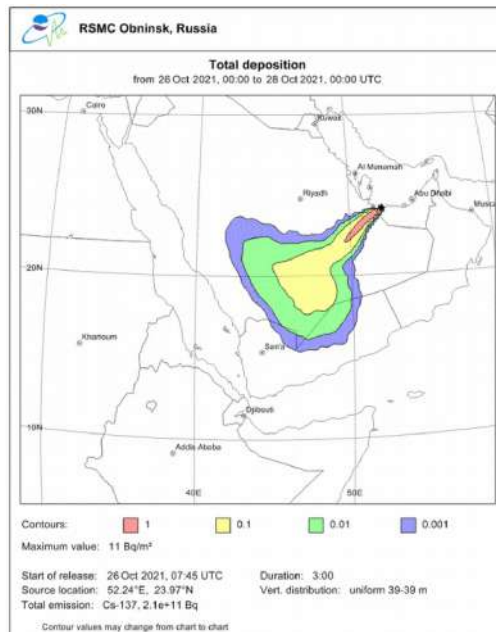


## Maximum value [Bq/m²]

RACPC - 1,73 e+00  
RSMC Exeter – 3.033 e-01  
RSMC Tokyo- 2,52E+01  
RSMC Obninsk-1,1e+01



RACPC UHMC

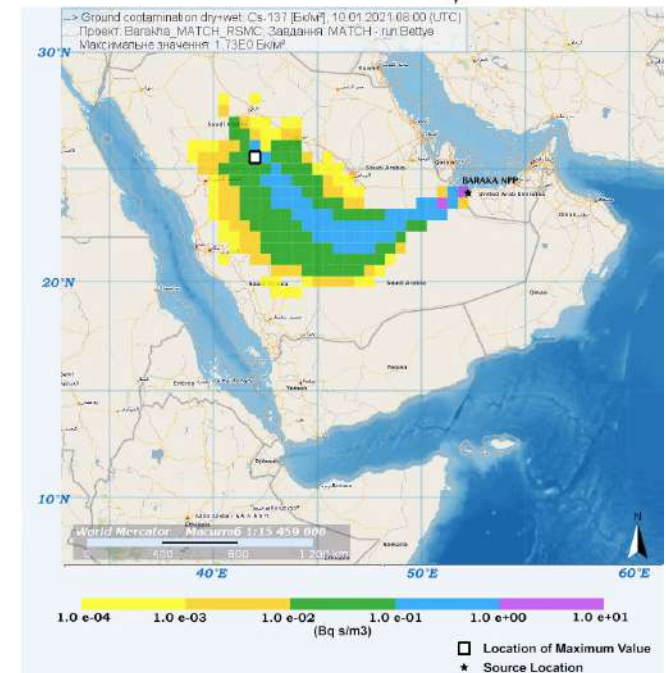


## Location of Max value

RACPC - 50,96E ; 23,53N  
RSMC Exeter -50,5E ; 23,5N  
RSMC Tokyo- not specified  
Rsmc Obninsk-not specified

## Contour of minimum value for visualization

RACPC - 1,0 e-04  
RSMC Exeter - 1,0 e-04  
RSMC Tokyo- 1,0 e-04  
Rsmc Obninsk- 1,0 e-03

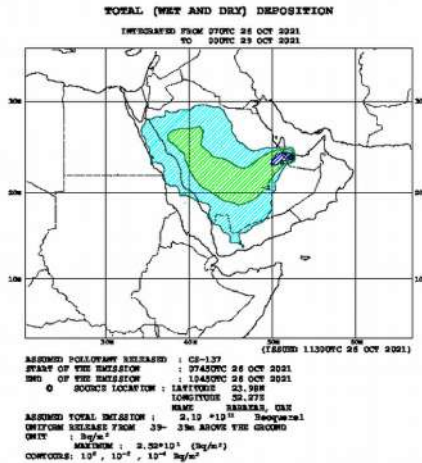




# Total deposition 72h time integrated. Valid from 08:00 26/10/21 to 08:00 29/10/21

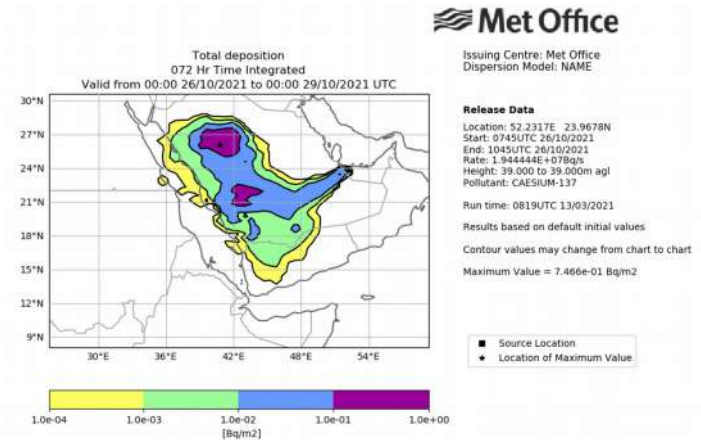
## RSMC Tokyo Meteorological Data Report Total Deposition 26oktober-29 oktober 2021

### EXERCISE-EXERCISE-EXERCISE

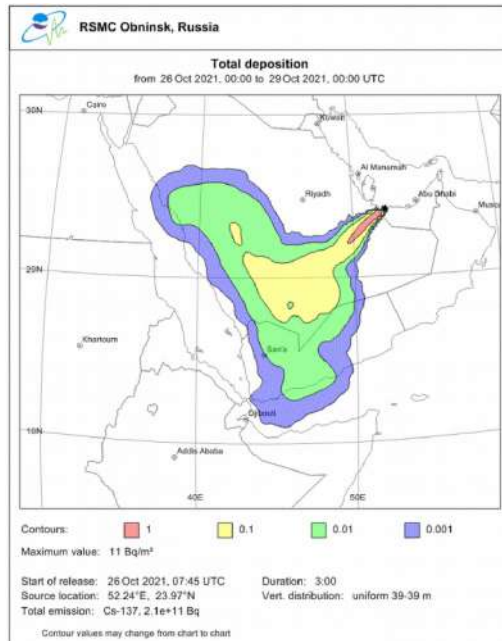


Maximum value [Bq/m2]

RACPC - 1,83e+00  
RSMC Exeter – 7,47E-01  
RSMC Tokyo- 2,52E+01  
RSMC Obninsk-1,1e+01



RACPC UHMC

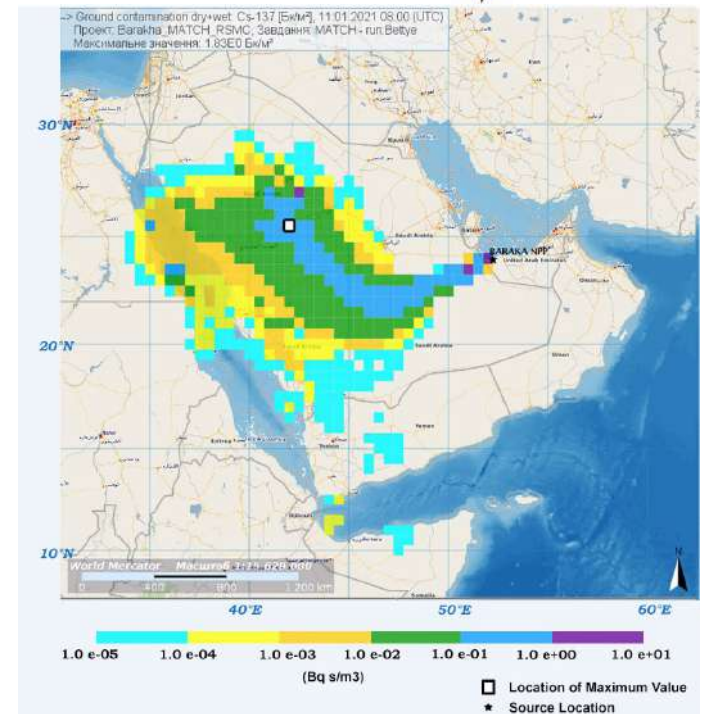


Location of Max value

RACPC - 41.97E ; 25,53N  
RSMC Exeter - 41.5 E ; 25,8N  
RSMC Tokyo- not specified  
Rsmc Obninsk-not specified

Contour of minimum  
value for visualization

RACPC - 1,0 e-05  
RSMC Exeter - 1,0 e-04  
RSMC Tokyo- 1,0 e-04  
Rsmc Obninsk- 1,0 e-03



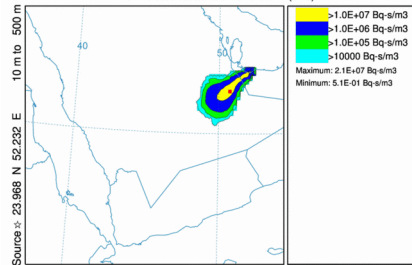
# Result of simulation performed by RSMC BeiJing

ConvEx-3 (2021) – Barakah NPP (UAE) (EXERCISE)

RSMC Beijing Meteorological Data Report

Air Concentration 26 October – 27 October 2021

RSMC Beijing China Meteorological Administration  
Exposure (Bq-s/m3) averaged between 0 m and 500 m  
Integrated from 0745 26 Oct to 0009 27 Oct 21 (UTC)  
X131 Release started at 0745 26 Oct 21 (UTC)

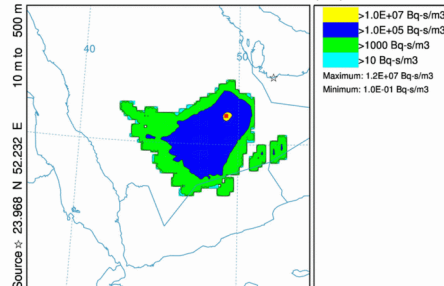


GRAG METEOROLOGICAL DATA

Created: 0806UTC 26/10/2021 (day/month/year) RSMC Beijing  
Source: Barakah NPP, UAE lat:23.8678 lon:52.2317 hgt:10 to 500.0 m  
Release: ID: C137 Rate: 0.7E+11 Bq/hr Duration: 3 hr  
Distribution: Uniform between 10 and 500.0 m AGL  
Deposition: Wet and Dry  
Meteorology: 0600 UTC 26 to 2021 GRAPES GFS  
Note: Contour values may change from chart to chart  
Response: EXERCISE EXERCISE EXERCISE

Air Concentration 27 October – 28 October 2021

RSMC Beijing China Meteorological Administration  
Exposure (Bq-s/m3) averaged between 0 m and 500 m  
Integrated from 0009 27 Oct to 0005 28 Oct 21 (UTC)  
X131 Release started at 0745 26 Oct 21 (UTC)

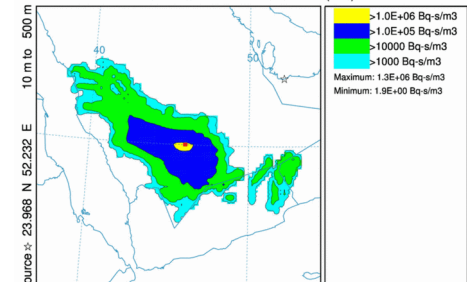


GRAG METEOROLOGICAL DATA

Created: 0806UTC 26/10/2021 (day/month/year) RSMC Beijing  
Source: Barakah NPP, UAE lat:23.8678 lon:52.2317 hgt:10 to 500.0 m  
Release: ID: C137 Rate: 0.7E+11 Bq/hr Duration: 3 hr  
Distribution: Uniform between 10 and 500.0 m AGL  
Deposition: Wet and Dry  
Meteorology: 0600 UTC 26 to 2021 GRAPES GFS  
Note: Contour values may change from chart to chart  
Response: EXERCISE EXERCISE EXERCISE

Air Concentration 28 October – 29 October 2021

RSMC Beijing China Meteorological Administration  
Exposure (Bq-s/m3) averaged between 0 m and 500 m  
Integrated from 0005 28 Oct to 0005 29 Oct 21 (UTC)  
X131 Release started at 0745 26 Oct 21 (UTC)

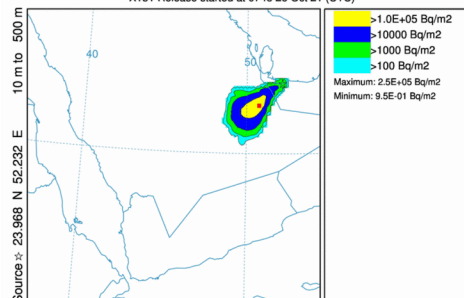


GRAG METEOROLOGICAL DATA

Created: 0806UTC 28/10/2021 (day/month/year) RSMC Beijing  
Source: Barakah NPP, UAE lat:23.8678 lon:52.2317 hgt:10 to 500.0 m  
Release: ID: C137 Rate: 0.7E+11 Bq/hr Duration: 3 hr  
Distribution: Uniform between 10 and 500.0 m AGL  
Deposition: Wet and Dry  
Meteorology: 0600 UTC 28 to 2021 GRAPES GFS  
Note: Contour values may change from chart to chart  
Response: EXERCISE EXERCISE EXERCISE

Total Deposition 26 October – 27 October 2021

RSMC Beijing China Meteorological Administration  
Deposition (Bq/m2) at ground-level  
Integrated from 0745 26 Oct to 0009 27 Oct 21 (UTC)  
X131 Release started at 0745 26 Oct 21 (UTC)

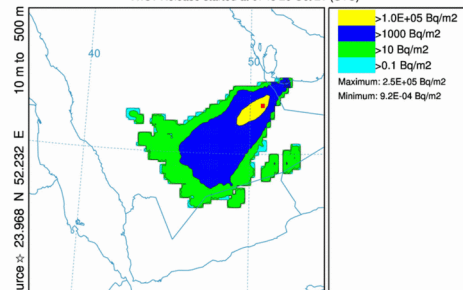


GRAG METEOROLOGICAL DATA

Created: 0806UTC 26/10/2021 (day/month/year) RSMC Beijing  
Source: Barakah NPP, UAE lat:23.8678 lon:52.2317 hgt:10 to 500.0 m  
Release: ID: C137 Rate: 0.7E+11 Bq/hr Duration: 3 hr  
Distribution: Uniform between 10 and 500.0 m AGL  
Deposition: Wet and Dry  
Meteorology: 0600 UTC 26 to 2021 GRAPES GFS  
Note: Contour values may change from chart to chart  
Response: EXERCISE EXERCISE EXERCISE

Total Deposition 27 October – 28 October 2021

RSMC Beijing China Meteorological Administration  
Deposition (Bq/m2) at ground-level  
Integrated from 0745 26 Oct to 0005 28 Oct 21 (UTC)  
X131 Release started at 0745 26 Oct 21 (UTC)

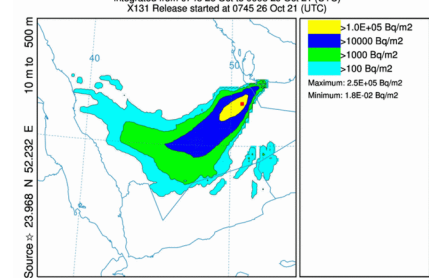


0800 27 Oct 21 GRAG FORECAST INITIALIZATION

Created: 0806UTC 26/10/2021 (day/month/year) RSMC Beijing  
Source: Barakah NPP, UAE lat:23.8678 lon:52.2317 hgt:10 to 500.0 m  
Release: ID: C137 Rate: 0.7E+11 Bq/hr Duration: 3 hr  
Distribution: Uniform between 10 and 500.0 m AGL  
Deposition: Wet and Dry  
Meteorology: 0600 UTC 26 to 2021 GRAPES GFS  
Note: Contour values may change from chart to chart  
Response: EXERCISE EXERCISE EXERCISE

Total Deposition 28 October – 29 October 2021

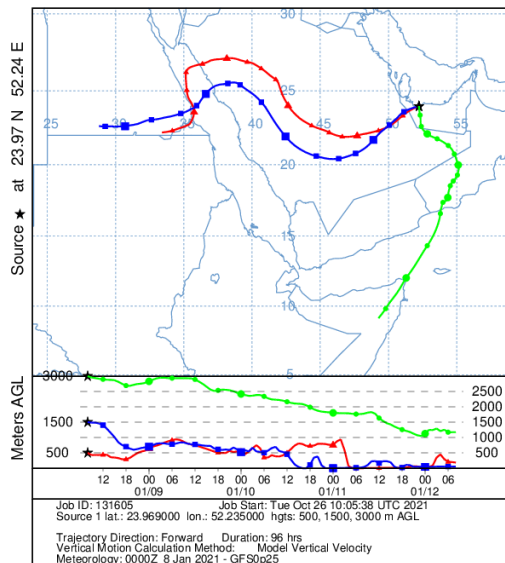
RSMC Beijing China Meteorological Administration  
Deposition (Bq/m2) at ground-level  
Integrated from 0745 26 Oct to 0005 29 Oct 21 (UTC)  
X131 Release started at 0745 26 Oct 21 (UTC)



0000 28 Oct 21 GRAG FORECAST INITIALIZATION

Created: 0806UTC 28/10/2021 (day/month/year) RSMC Beijing  
Source: Barakah NPP, UAE lat:23.8678 lon:52.2317 hgt:10 to 500.0 m  
Release: ID: C137 Rate: 0.7E+11 Bq/hr Duration: 3 hr  
Distribution: Uniform between 10 and 500.0 m AGL  
Deposition: Wet and Dry  
Meteorology: 0600 UTC 28 to 2021 GRAPES GFS  
Note: Contour values may change from chart to chart  
Response: EXERCISE EXERCISE EXERCISE

NOAA HYSPLIT MODEL  
Forward trajectories starting at 0800 UTC 08 Jan 21  
GFSQ Meteorological Data



## Forward trajectories at 08:00 UTC 26/10/2021 performed by RSMC and RACPC



RACPC UHMC

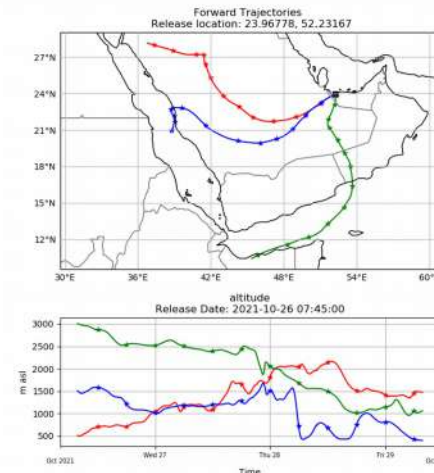
Performed with using HYSPLIT  
model

<https://www.ready.noaa.gov/hypub-bin/trajtype.pl>



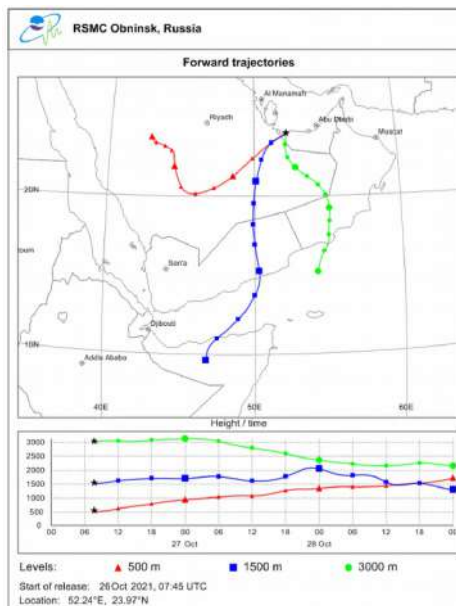
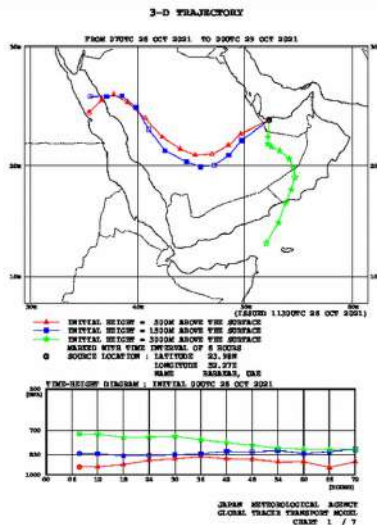
Issuing Centre: Met Office  
Dispersion Model: NAME

**Release Date**  
Location: 52.23167E 23.96778N  
Start: 07:45 UTC 26/10/2021  
Heights: 500, 1500, 3000 m agl  
Run time: 0819UTC 13/03/2021



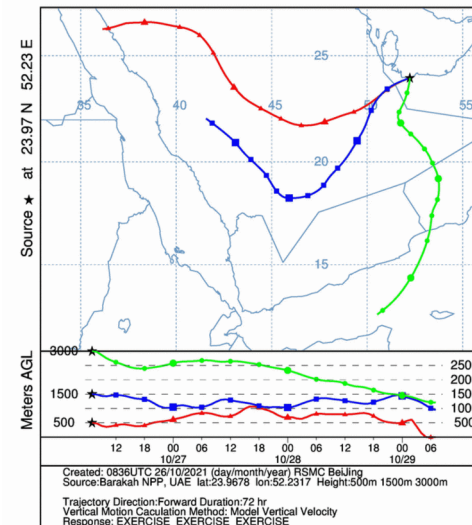
## RSMC Tokyo Meteorological Data Report Forward trajectories at 08:00 UTC 26/10/21

### EXERCISE-EXERCISE-EXERCISE



## Forward Trajectories 26 October 2021

RSMC Beijing China Meteorological Administration  
Forward trajectories starting at 0745 UTC 26 Oct 21  
05 UTC 28 Oct GRAG Forecast Initialization

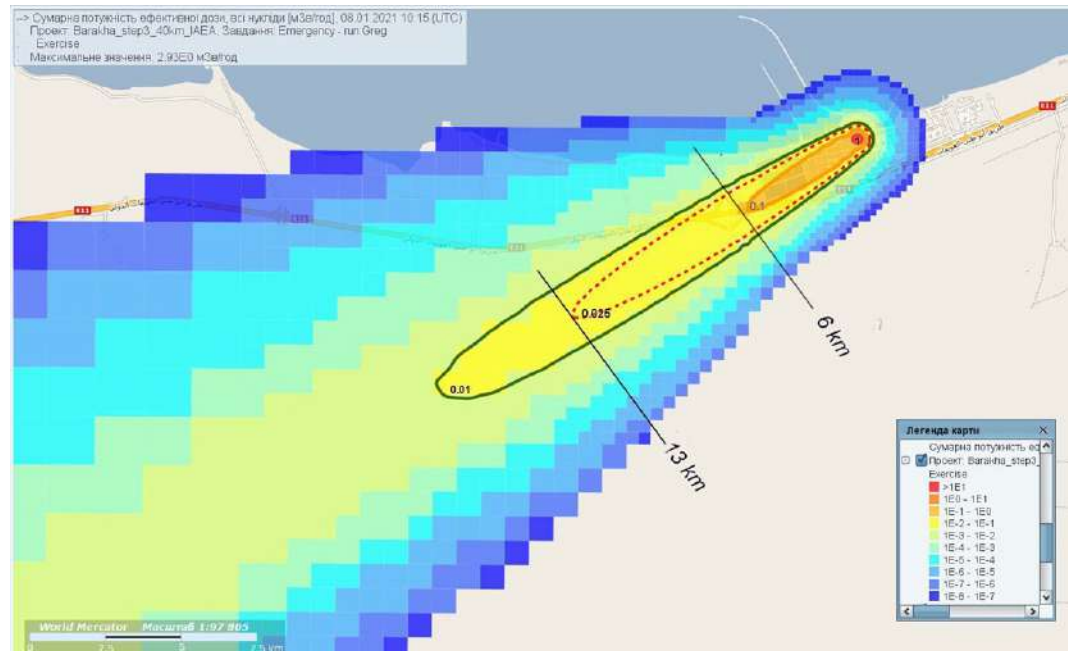






**Gamma Dose Rate  
Emergency area  
Published by UAE during  
training in IRMIS**

**Gamma Dose Rate  
Emergency area  
Simulation result  
Performed with JRodos**





Ukrainian Hydrometeorological Center  
State Service on Emergency of Ukraine

***Thank you for  
listening***

For further information, please contact us  
[ceprac@meteo.gov.ua](mailto:ceprac@meteo.gov.ua)