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Operation of Web-based Atmospheric Dispersion Model for a Nuclear Accident

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INTRODUCTION

Radiological Accident Preparedness System in Korea (RAPSK)

METHODS/DATA

General Structure of RAPSK including Atmospheric Dispersion Model

START

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Some Examples of Web-Based System

CONCLUSION

Application and Extension of RAPSK for a Nuclear Accident

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Introduction

- A radiological emergency preparedness system in Korea has been developed to predict the behavior of radioactive material released into the environment and estimate the dose assessment for humans in case of a nuclear accident in neighboring countries, including Korea.

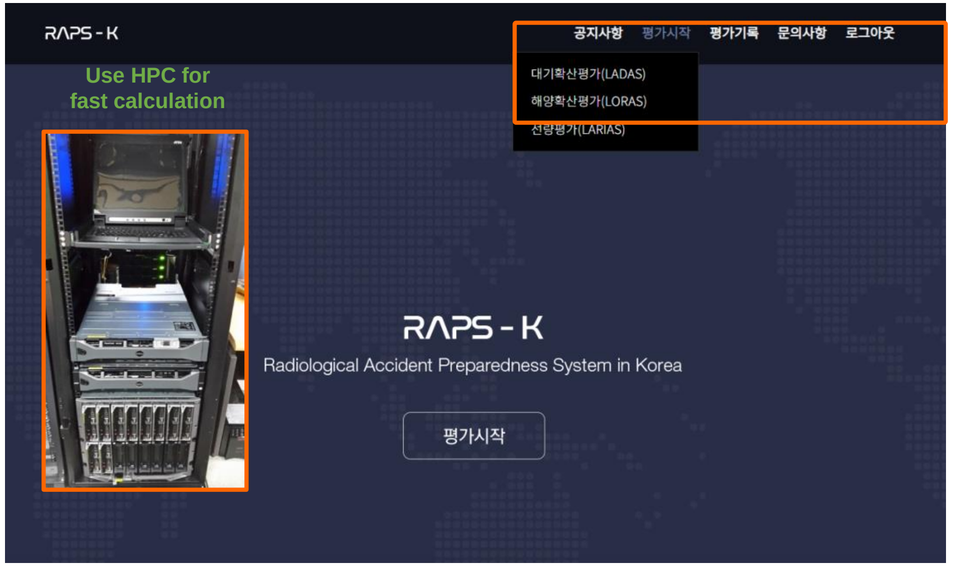
- The system is composed of atmospheric dispersion, marine dispersion, and dose assessment models, along with a graphic user interface module. It can evaluate the dispersion patterns of radionuclides in the air and ocean, and the short-term and long-term radiological effects of a nuclear accident on humans.

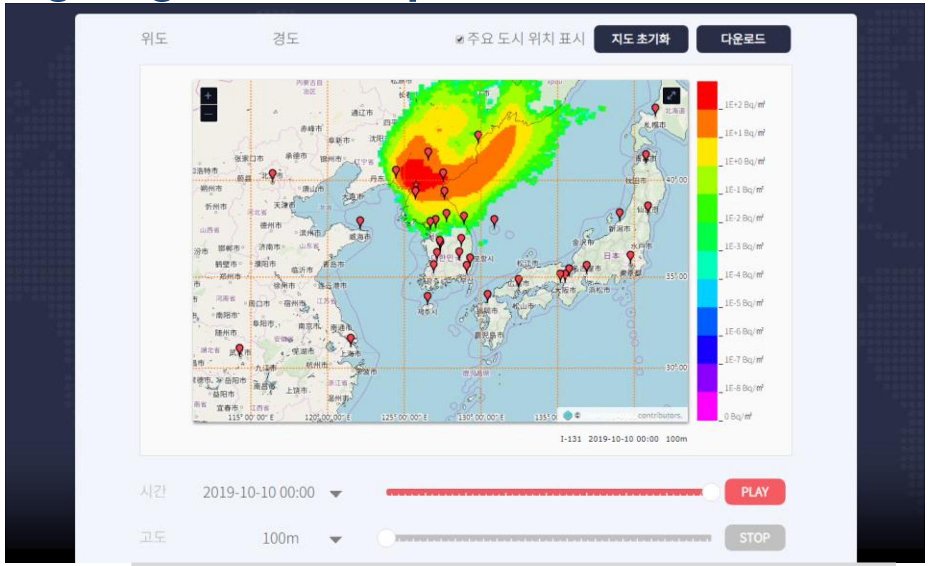
- It has been constructed on the web to allow users to access it easily and simply through an intrinsic IP address, username, and password.

- The atmospheric dispersion, marine dispersion, and dose assessment models have already been validated by model-to-model comparisons and measurements from the Chernobyl and Fukushima accidents.

- The described system is now in operation for government and nuclear-related organizations in Korea in case of a nuclear accident.

Emergency Response Systems utilizing LADAS (Lagrangian Atmospheric Dose Assessment System) model





LADAS in RAPS-K

- ✓ Operation by KAREI (nuclear accident)
- ✓ Global / Regional (East Asia) / (Local)
- ✓ Related governmental agencies (User Group)
- ✓ LADAS → Dose calculation
- ✓ Employ HPC for fast calculation

Common features

- ✓ Governmental Use Only (not opened to public)
- ✓ Web based GUI
- ✓ Real-time NWP data (KMA)
- ✓ Provide countermeasures
- ✓ Scenario development → Training program (feedback)

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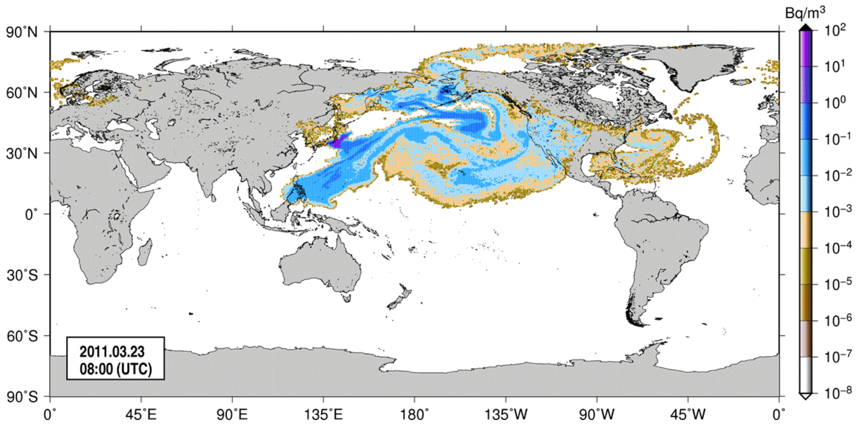
Example of LADAS in RAPSK

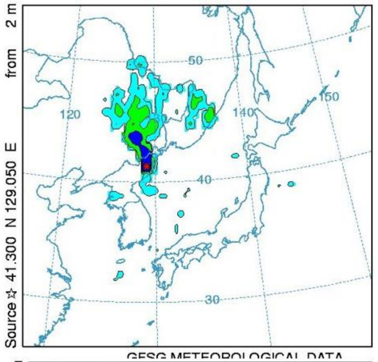
Computational Domain of LADAS

Domain	Area	Horizontal	Resol.	NWP data
Global	World	0 ~ 360 E 90 S ~ 90 N	~ 30 km	KMA, NOAA, ECMWF
Region al	North-East	**100 ~ 175 E** 12 ~ 54 N	~ 20 km	KMA
Local	Korea	Radius 40 km	~ 1,2 km	KMA, KAERI model

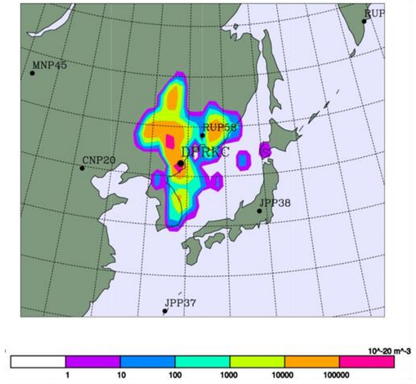


Evaluation of North Korea 5th nuclear test

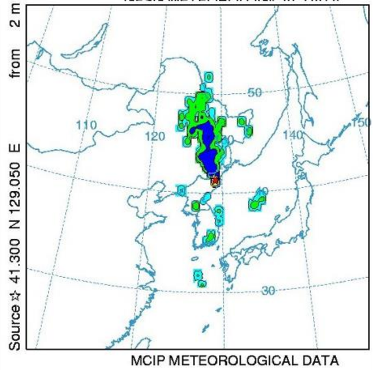
2016. 9.12 18:00 UST ~ 9.12. 21:00 UST (=2016. 9. 13. 6 KST)



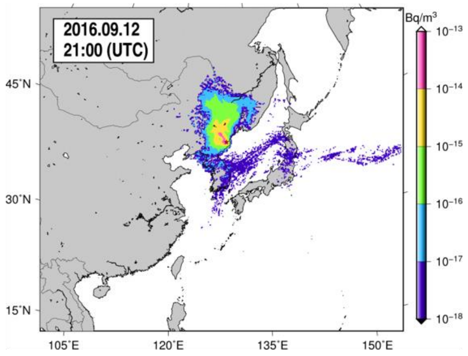
Hysplit :
0.5° NOAA



WebGrape :
0.5° ECMWF



Hysplit :
25 km KMA



LADAS :
12 km KMA

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Conclusions

- **Lagrangian models can be useful tool to evaluate the behavior of pollutants in environment, fast and real-time**
- **Most of emergency rapid-response models have been developed with Lagrangian types**
- **Wind and currents are one of the important factors to operate in dispersion models**
- **RAPS-K has been developed to evaluate the dispersion patterns of the radionuclides released into environment for a nuclear accident**
- **Especially, atmospheric and marine dispersion models have to link to investigate the effects of contamination due to the depositions in marine environment**
- **Integrated radiological assessment system in Korea has been constructed to protect human and environment for a nuclear accident from neighboring countries or worldwide**

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