Atmospheric Dispersion and Impact Assessment Modeling (ADIAM) systems are more and more decision support tools for radiological and chemical emergency situations. However, Fukushima nuclear accident illustrated that their operational and effective application still raises many issues regarding constraints associated to crisis management as much uncertain conditions, time-pressure and high stakes. In addition, ADIAM use is mainly grounded in a social context at the boundary between scientific organizations which develop and operate them and emergency decision makers in charge of population protection countermeasures. This research aims to contribute to assess the kind of support ADIAM systems and expertise can bring regarding crisis command centers and their decision making environment.

## Data collection

- Data were collected from 5 exercises performed between 2012 and 2013 of four hours long each.
- They consisted in tabletop exercises that reproduce a crisis command center (COD) (Figure 1).
- Scenario: a radiological terrorist attack in a metropolitan train station.
- INHESI animation team plays the upper and lower levels of the French crisis organization surrounding the COD level, as well as the media pressure.
- A scientific advisor (an ADIAM expert) takes part to the exercises.

## Introduction

**Data analysis**

Each call generally gather one to two actors. Each actor is equipped with a computer and a phone. A collective map and white boards are also available in COD.

## Results

### Study of actors interactions inside the COD

**Figure 2** and **3** illustrate similar interaction patterns.

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- It seems that the decision maker mainly relies on firefighters:
  - To assess the situation and actions proceedings on the field.
  - They are also the first expert advisors on chemical and radiological risks before the arrival of scientific advisors.

- Once the scientific advisor arrives at the COD, the Decision maker's COD situation assessment is mainly based on a tight collaboration between firefighters and the scientific advisor.

### Communication distribution between situation assessment and management

- Codification sub-categories regarding communication styles allow to assess the contribution of exchanges relating to situation assessment (grey) and management (green) illustrated in **Figure 4 & 5**.

- Results underline that communication exchanges in the COD regard mainly field situation assessment.

- In the same trend, Scientific adviser interactions mainly support the understanding of the release phenomenology and its potential consequences rather than the formulation of response strategies.

### Exercises’ presentation

- **Each exercise is analyzed in 3 episodes.**

**Figure 2**. Representation of the INHESI crisis command center during the December 27th 2013 exercise

- **Each exercise is analyzed in 3 episodes.**

**Figure 3**. Assessment of the COD teams interaction with the Decision Maker (left) and the scientific adviser (right). Radial scale: exchanges frequency.

- **Figure 4**. Quantitative distribution of interactions regarding situation assessment (grey) and situation management (green) in the COD (left) and with the scientific adviser (right).

**Figure 5**. Quantitative distribution of interactions regarding situation assessment (grey) and situation management (green) in the COD (left) and with the scientific adviser (right).

### Content analysis (Grawitz, 2001)

- Development of 4 categories analysis grid (Boos et al., 2011).

### Study of phases dedicated to situation assessment (grey) and its management (green):

- Study of situation states and their management.

### Qualitative analysis of the contribution of ADIAM results and expertise to the crisis command center.

<table>
<thead>
<tr>
<th>Episode</th>
<th>CBRN detection</th>
<th>Scientific adviser arrival</th>
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<tbody>
<tr>
<td>1</td>
<td>T2</td>
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- On-going and future work will more specifically analyse the use of ADIAM cartographic results as a support to build common situation awareness and a better collaboration between crisis teams.

- The research needs also to integrate data from different experimental fields. INHESI crisis training exercises have three main biases regarding national crisis exercises: (i) participants don’t know each other before the exercise; (ii) they don’t know necessarily the area in which the scenario takes place; (iii) they are not familiar with the tools used during the exercises. In order to address these biases, this methodology will be applied on two national-level exercises simulating a chemical terrorist attack and a nuclear power plant accident.

## References