# MTG-IRS Science Plan

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# Outline (high level) structure for MTG-IRS Science Plan

| Title | Lead coordinators | Contributors |
|---|---|---|
| **Chapter 1**: The rationale for MTG-IRS and system description | Dorothee Coppens | |
| **Chapter 2**: Cross cutting challenges | Johannes Orphal | |
| **Chapter 3**: Support for operational meteorology | Christina Koepken-Watts | |
| **Chapter 4**: Support for AC monitoring and forecasting | Pierre Coheur | |
| **Chapter 5**: Support for future climate science | Claude Camy-Peyret | |
| **Chapter 6**: Scientific process studies | Tony McNally | |

# Chapter 1: The rationale for MTG-IRS and system description

- Combining two technologies GEO and HSRIR
- Benefits of GEO – high temporal resolution
- Benefits of HSRIR – high vertical resolution information on Met variables and information atmospheric composition (AC)
- Description of MTG
- Description of IRS
- Key aspects of data delivery strategy and archiving
- Supporting **real time operational** applications
- Supporting **scientific process studies** (with potential massive impacts for operational applications)

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Chapter Lead(s) :Dorothee Coppens
Contributors :

# Chapter 2: Cross cutting challenges

Pre-requisites for MTG-IRS to deliver the science plan….

- Instrument calibration (radiometric / spectral) and validation
  - Mostly overview, but we can refer to existing CAL/VAL plan ?

- Radiative transfer capability
  - Spectroscopy
  - Line-by-line models
  - Fast models

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Chapter Lead(s) : Johannes Orphal
Contributors :

# Chapter 3: Support for operational meteorology

- High speed NRT generation of L2 Met products for forecasters that are complementary to the model output they have available
  - Instability / CAPE / winds / temperature / humidity

- High speed NRT generation of L2 Met products suitable for operational data assimilation
  - Transformed retrievals or retrievals with full error covariances / averaging kernels
  - 3D winds

- High speed NRT generation of L1 data for operational data assimilation
  - Radiances
  - PCA products
  - Meta-data on scene heterogeneity

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Chapter Lead(s) :Christina Koepken-Watts
Contributors :

# Chapter 4: Support for AC monitoring and forecasting

- High speed NRT generation of L2 AC products for forecasters that are complementary to the model output they have available
  - Air quality, aerosol…
- High speed NRT generation of L2 Met products suitable for operational data assimilation
  - Retrievals with full covariances / averaging kernels
- High speed NRT generation of L1 data for operational assimilation
  - Radiances
  - PCA products
  - Meta-data on scene heterogeneity

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Chapter Lead(s) :Pierre Coheur
Contributors :

# Chapter 5: Support for future climate science

- Generation and archiving of L1 datasets with traceable calibration
  - Radiances
  - Meta-data

- Generation and archiving of L2 / L3 datasets with traceable calibration
  - Met / AC variables
  - Meta-data

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Chapter Lead(s) :Claude Camy-Peyret
Contributors :

# Chapter 6: Scientific process studies

(*some place holder ideas based on* exploiting time/space sampling and hyperspectral facility of IRS)

| Science Topic / Process | Meteorology | Atmospheric Composition | Climate |
|---|---|---|---|
| Improving understanding diurnal properties of the land and ocean (Skin T / emis) | ● | ● | ● |
| Diurnal cycle of clouds, hydrological cycle and deep convection | ● | ● | ● |
| Improved RT of clouds, aerosols, solar radiation and the surface | ● | ● | ● |
| Genesis and forecasting of Atlantic Tropical cyclones | ● | ● | ● |
| Aerosol plume trajectory (e.g. Saharan dust) and diurnal cycle of aerosols | ● | ● | ● |
| Convection role in AC processes (including aerosol) | ● | ● | ● |
| Diurnal cycle and rapid evolution of gas AC | ● | ● | ● |
| … | ● | ● | ● |

Question: Do we solicit these for the science plan from outside the MAG ?

# Example Template for Chapter 6 Study:

| | |
|---|---|
| **1. What is the process ?** | |
| **2. Why does it matter ?** | |
| **3. How will IRS improve understanding ?** | |
| **4. What will be done and who will do it ?** | |
| **5. What are the expected outcomes** | |

# Example contribution: Observing genesis and forecasting of Atlantic Tropical cyclones:

| | |
|---|---|
| **1. What is the process ?** | Observing and understanding temperature, humidity and cloud changes that signal the genesis and / or rapid intensification / weakening of Tropical cyclones in the Atlantic basin |
| **2. Why does it matter ?** | These weather events have a devastating impact and any advances in range or accuracy of NWP forecasts can have profound consequences. Early warning of changes captured by forecast initial conditions is critical. |
| **3. How will IRS improve understanding ?** | IRS will provide information on temperature, cloud and humidity with unprecedented accuracy, spatial scale and time frequency over key regions such as cost of W. Africa |
| **4. What will be done and who will do it ?** | Assimilation of IRS spectra at ECMWF:<br>Task 1<br>Task 2<br>Task 3: |
| **5. What are the expected outcomes** | Improved NWP forecasts allowing improved steps to be taken to save lives and protect property. |