

MIMOSA – extended package

Guide with lesson plans

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MIMOSA – extended package

Guide with lesson plans

Title	MIMOSA
Authors	Alain Hauchecorne et Alain Sarkissian LATMOS / UVSQ / CNRS 11 Bld d'Alembert 78280 GUYANCOURT France
Students' age	15+
Level of education or type of school	Upper Secondary School
School subject	Physics, Mathematics
Short description of content	
The numerical model MIMOSA allows to understand and to predict the dynamics of the wind, vortex and the transport of air masses in the polar stratosphere (high altitude, 12-25 km). This package will use MIMOSA maps to make understandable these notions. <u>The troposphere</u> To understand how the earth's atmosphere behaves, look at the temperature of the air and its variation as a function of altitude, called the temperature profile. The figure below shows the air temperature as a function of altitude from the ground up to 35 km. Knowing that warm air always tends towards the colder, less dense mass of air above it, an air mass of 0 to 10 km goes up. The air in this part of the atmosphere will therefore be constantly stirred, mixed with all the altitudes, rising it cools and mixes with the rest. Similarly, cold air descends and warms up. This part of the atmosphere is called the troposphere.	

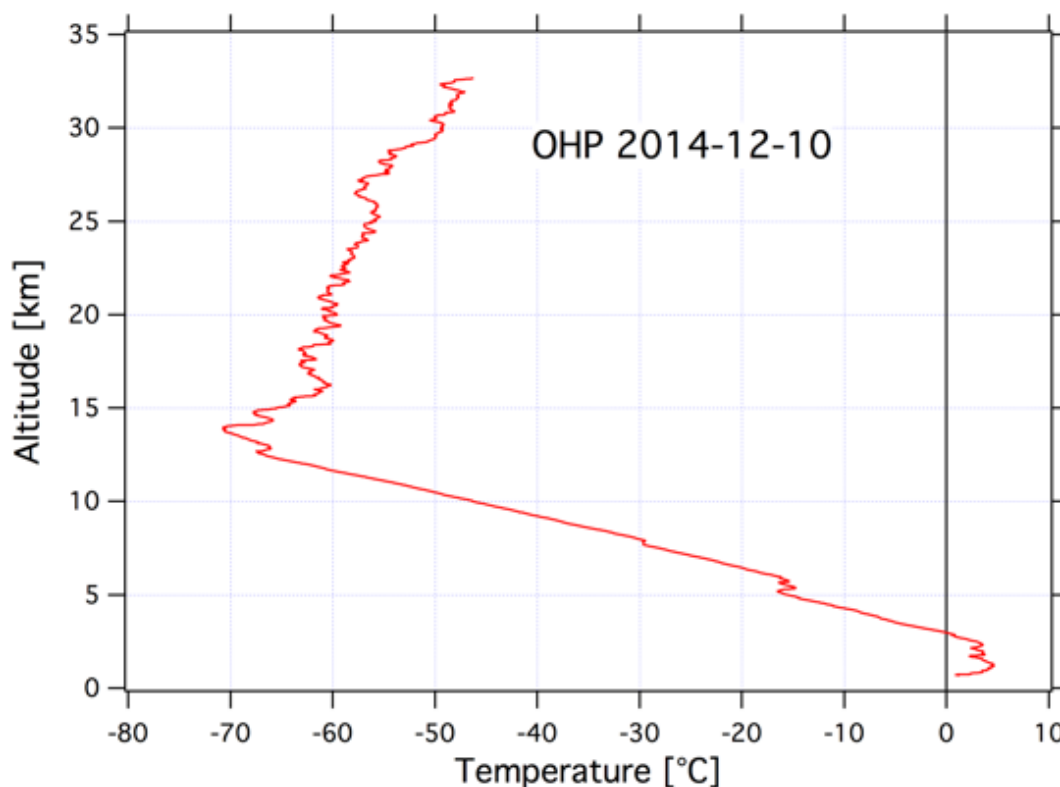
The stratosphere

The upper part of the temperature profile is different (from 10 to 35 km of altitude): the temperature increases with altitude. A mass of air will not be tempted to rise, it will remain at its level and it creates layers of atmosphere with identical thermal properties, strata, hence the name stratosphere for this part of the atmosphere. In a stratum, the air can mix with the neighbouring air masses with the same properties (horizontally, therefore without passing over a layer of the bottom or top).

The intermediate part is called the tropopause and indicates the end of the troposphere and the beginning of the stratosphere, with intermediate properties.

MIMOSA is a model that follows the movement (dynamics) of the air masses in the stratosphere to study its evolution. Since these air masses do not mix with the air masses from below or above, MIMOSA can follow the evolution of these air masses over several days.

In the Arctic, in winter (polar night) the stratosphere in addition to not being able to mix vertically, will be caught in a vortex, the polar vortex that will prevent it from mixing with neighbouring air masses to create a vortex or vortex Arctic polar. Our task will be to understand the behaviour of this vortex.



Concept and learning outcomes

The student knows:

- Notion of wind, wind speed, wind direction
- Distances in maps
- Speeds to measure and to calculate

The student understands:

- Atmospheric temperature profile
- Perfect gas law

The student can:

- Measure distances on maps
- Interpret transport of air masses
- Understand and interpret the dynamics of the stratospheric polar vortex

Elements of educational package (created in ERIS)

1-Guide	Guide for this package
2-Présentation ppt	File pptx , presentation
2a-Mimosa - movie	Movie based on presentation
3-Mimosa.doc	Text for the tutorial in doc format
4-Kahoot_answers	Answers to the questionnaire (see 5-)
5-Kahoot	https://play.kahoot.it/#/?quizId=972a03e6-9f90-457c-afe1-91c51deb8bcb
6-EarthWind10hPa23Jan2017	https://youtu.be/b0XXD-O-p-Q Movie on the dynamics of the stratospheric air in polar region at the altitude of around 25 km
7-MIMOSA.mv4	https://www.youtube.com/watch?v=mrgKSqHOiOI Movie on the evolution of the polar vortex,
8-ImagesMIMOSA	125 images from MIMOSA for different periods
9-Sonde OHP 2014-12-10	Temperature profile measured at Observatoire de Haute Provence in France

Additional materials for teachers (websites links, science articles, etc.)

http://ether.ipsl.jussieu.fr/ether/pubipsl/mimosa_fr.jsp

Lesson 1

Subject: MIMOSA

Lesson plan for "MIMOSA – extended package"

In order to conduct the lesson, it will be necessary to provide:

- a multimedia projector for the presentation, computer for groups of 2-3 student;
- No print out for students: all necessary documents are in the package and can be visualise on the computer.

Aims of the lesson:

The general aim and the detailed aims are compatible with the aims of the educational package "Mimosa".

Lesson Goals:

The overall goal and detailed objectives are consistent with the objectives of the "Mimosa" education package.

We propose to follow the indications provided in the ppt file n°2

Lesson :

1. Start of the lesson, organizational activities, attendance list check.
2. Start ppt file of the presentation (No 2)
3. During the presentation indications are provided in ppt file to show movies 5 and 6 (on YouTube)
4. Kahoot quiz if internet available, or file 5- (answers for the teacher in file 4-)
5. If enough time or home work, exercises of the file 3-Venus.doc to be explained by the teacher using files 8- and 9-