

Polar lows – basic package

Guide with lesson plans

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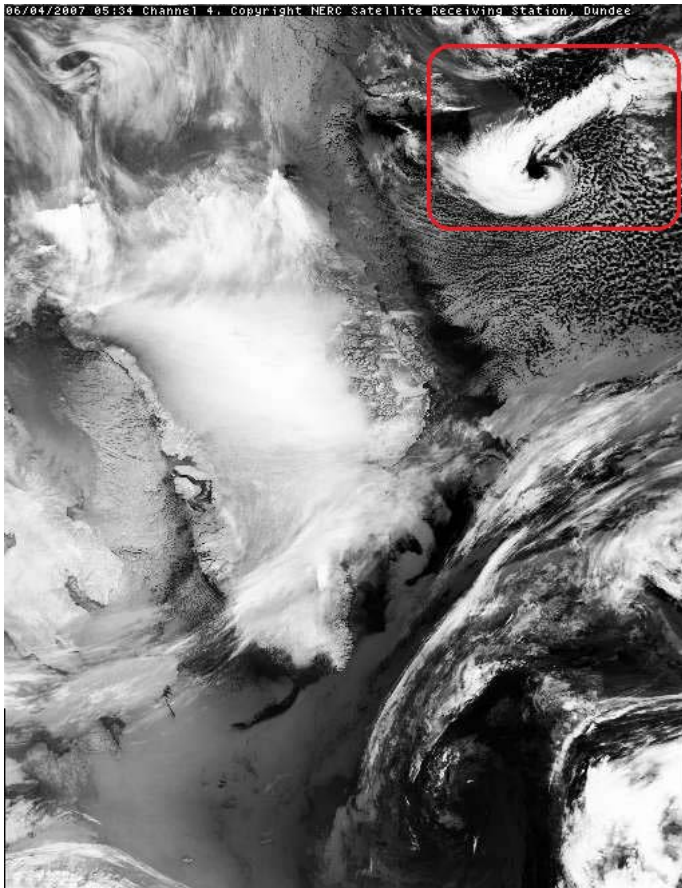
Guide with lesson plans

Title	POLAR LOWS
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Students' age	12+
Level of education or type of school	Lower Secondary School
School subject	Physics, Mathematics
Short description of content	
Understanding Polar Lows Using Satellite Imagery During winter, small cyclones – typically 200 to 600 km in diameter – develop in subarctic regions over areas free of sea ice. The most intense cyclones are called polar lows. These severe storms usually form when polar air is transported over maritime areas. This cold and dry air destabilises the lowest layers of the atmosphere when it arrives over relatively warm waters, creating a polar low. Short-term forecasting of polar lows remains challenging, because they develop very rapidly, in areas with very few observations. The understanding of the formation of polar lows has been substantially improved with the advent of satellite observations in the late seventies. Retreating sea ice exposes new ocean areas to extreme weather systems such as polar lows. Climate change could therefore potentially change where and when polar lows will occur in the future. During the winter, small-scale cyclones, typically 200 to 600 km, develop on Arctic-free ice seas. The most intense of them are called Polar Lows. These severe low pressure systems usually form along the sea ice along warm ocean currents as a result of intrusions of polar air masses. Indeed, the icy and dry air coming either from the pack ice or from continents covered with ice destabilizes the lower layers of the troposphere when it circulates over	

the relatively hot open seas.

Considerable advances in knowledge of the structure, physics of polar lows came from satellite observation. But their short-term forecasting is still a challenge. Climate change could also change both regions and times of occurrence.

Image : Satellite image of a "Polar Low" observed in the Arctic Sea on 06 04 2007, framed in red. Greenland appears clearly at the top left, covered with clouds.



Why are we interested in the Polar Lows ?

These systems are associated with strong surface winds with very often gusts that can be very violent. The conditions at sea during the passage of a Polar Low can be dangerous with strong waves, brutal snowfall and blizzard.

The Polar Lows, characterized by a rather small spatial and temporal extension, can be triggered extremely rapidly, making them particularly difficult to predict, and dissipate shortly after reaching the ribs.

These extreme weather events represent a real risk to the region's maritime and coastal activities, including shipping, fishing and offshore oil and gas platforms.

Concept and learning outcomes

The student knows:

- Notions of meteorology
- Notions of satellite images

The student understands:

- Cyclones
- Mesoscale phenomena
- Histogram

The student can:

- Discuss on the statistics of polar formation in the Arctic
- Understand polar low formation process

Elements of educational package (created in ERIS)

1-Guide	Methodological guide for teachers
2-Polar Low	Pptx of the presentation linked to this package
2a-Polar Low - movie	Movie based on presentation
3-Polar Lows.doc	The tutorial for this package
4-Kahoot_answers	Answers for the Kahoot
5-Kahoot	https://play.kahoot.it/#/?quizId=9dd861d4-3ea6-41ec-8f61-3becbfe2b741
6-Exercices Images	16 satellites images to study
7-Data...	The excel file containing the data for the analysis

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

No

Lesson 1

Subject: Polar Lows

Lesson plan for "Polar Lows – basic package"

To conduct the lesson, it will be necessary to provide:

- a multimedia projector for presentation, a computer for groups of 2-3 students;
- a spreadsheet and web-based software installed on the computer;
- No printing for the student, all necessary documents are in the pack and can be viewed on the computer.

Lesson Goals:

The overall goal and detailed objectives are consistent with the objectives of the "Polar Lows" educational 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 2-
3. Kahoot if internet available, or file 5- (answers for the teacher in file 4-)
4. If enough time or home work, exercises of the file 3-PolarLows EN.doc to be explained by the teacher using file 6- and excel file 7-