



METODKONFERENS UPPSALA 24-25 SEPTEMBER 2024

# **BIP-M OCH FÖRÄNDRAD PMU**

# WMO ger riktlinjer och ställer krav på prognosmeteorologers kompetens

- [WMO-No. 1083](#)
- WMO ställer krav (BIP-M) på utbildning
- Efter anställning
- Försvarsmeteorologer och civila meteorologer
- Inom SMHI samma baskrav på alla meteorologer
- Ytterligare krav på flygvädertjänster

# Vad är BIP-M?

- Utbildningskraven heter BIP-M (Basic Instruction Package for Meteorologists)
- Learning outcomes
  - Mathematics and Physics
  - Physical meteorology
  - Dynamic meteorology
  - Weather systems and services
  - Climate science and services
- Suggested learning outcomes

# ”Grå ruta” från Physical meteorology

## **Meteorologists shall be able:**

- To use their knowledge of atmospheric composition and radiative transfer to explain the structure of the atmosphere, global energy balance and the greenhouse effect, and common optical phenomena.
- To use the laws of thermodynamics to explain the stable stratification of the atmosphere and the effects of adiabatic and non-adiabatic processes, including the effects of water; to use a thermodynamic diagram to assess the properties and stability of the atmosphere.
- To summarize the micro-physical processes involved in the formation of clouds, precipitation and electrical phenomena and use a thermodynamic diagram to diagnose and predict these phenomena.
- To use knowledge of turbulence and surface fluxes to explain the structure and characteristics of atmospheric boundary layers and the behaviour of contaminants.
- To select instruments to observe surface and upper-air atmospheric phenomena, considering their physical principles of operation, sources and characteristics of error and uncertainty, and quality-control practices in use.
- To use relevant Earth- and space-based remote sensing to observe atmospheric and surface phenomena qualitatively and quantitatively; to explain how radiation measurements are made, how they are turned into atmospheric data, and what the uses and limitations of these data are.

# Learning outcomes från Physical met

<b>Atmospheric composition, radiation and optical phenomena</b>	
Atmospheric structure and composition	Summarize the characteristics of those atmospheric regions (troposphere, tropopause, stratosphere) of most relevance to meteorologists with reference to their major constituents, temperature and moisture content.
	Summarize the composition of the atmosphere, including trace gases, aerosols, mineral dust, volcanic ash and pollutants, including the effects of these constituents.
Radiation in the atmosphere	Explain the effects of variance in the distribution of atmospheric constituents (including aerosols, water vapour, clouds, greenhouse gases and reactive gases) and of surface conditions (moisture, vegetation, snow cover) on incoming and outgoing radiation.
Global energy balance	Explain the latitudinal and seasonal variations in climate due to the global radiational energy balance, variation in solar flux and the orbital characteristics of the Earth.
Optical phenomena	Explain the transparency of the atmosphere and the physics of common optical phenomena (for example, rainbows, haloes, coronas, sky colour, cloud colour) and describe the meteorological conditions that favour the occurrence of these phenomena.
<b>Thermodynamics and cloud physics</b>	
Applied thermodynamics	Apply the laws of thermodynamics to solve basic problems based on an understanding of the concept of an air parcel, including describing adiabatic and diabatic processes, dry and saturated adiabatic motions, and the associated conserved quantities.
Atmospheric moisture	Explain the physical basis for and applications of the common parameters used to represent the amount of moisture in the atmosphere; describe how these quantities are measured and the relationships between them.
	Use knowledge of thermodynamics to describe the phase-change processes of water, including the effects these phase changes have on both a hypothetical air parcel and on larger-scale processes.

# Hur har vi gått tillväga?

- Mappat kurser
- PMU
- Gråa rutor – skullkrav
- Aktuellt på våra breddgrader
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- Utöver BIP-M

2.4.1 Physical meteorology and collaboration	Describe the role of international collaboration in making and testing observations, with a particular emphasis on the comparison of the WMO Global Observing System.	skrivare, andrarna och proceduren i övrigt								
<b>Remote sensing</b>	These learning outcomes are intended to give students deep essential knowledge of common remote sensing systems and the ability to intelligently use these data in a range of situations. Further learning will be required to use remote sensing data in the workplace. Covered both remote BIP-M, especially those activities produce during the forecasting paradigm, should take into account the knowledge available from earlier for satellite and radar meteorology courses in the Compendium of PMO Competency Framework (PMO-Ma, 2019), which build on these objectives.	Uppsala fr.o.m höst 2023	Stockholm fr.o.m höst 2022	PMU 2024	Kommatorf deava kolava gillat	Uppsala fr.o.m höst 2023	Stockholm fr.o.m höst 2023			
<b>Principles of remote sensing</b>	Use remote-sensed data from radar, satellite and other systems together with surface observations, numerical weather prediction (NWP) and evidence to produce an overall picture of the state of the atmosphere and identify errors introduced by using remote data in a forecast.	Fjärrsens		HO1005 - Numeriska väderprognosmodell 7,5 hp, 3 HT						HO1004 - Numeriska väderprognosmodell 7,5 hp, 3 HT ens. de förtärdhet, vilka och mått i meteorologi.
	Select relevant remote-sensed data, taking into account the characteristics of the different systems, the geographical area of interest and the meteorological problem being considered.	Fjärrsens		HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT						HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT
	Obtain display formats to maximise the benefits of remote-sensed data, including spatial aggregation, sub-sampling and distribution.	Övrig Fjärrsens		PMU - Radar och satellit						
<b>Active sensing</b>	Explain how active sensing systems such as radar, lidar and Doppler detection and display (DDO) are used to provide quantitative and qualitative data about atmospheric parameters (for example, precipitation rate and type, wind speed and direction, cloud humidity, temperature, turbulence and surface loading) and phenomena such as thunderstorms, microbursts and fronts etc.	Fjärrsens		HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT	Kallman PjaffHäls för upp. data under PMU - radar och satellit, 12 fullspår från meteorologiska data från Uppsala (återkallarna)	Grön för SMHI. Uppgåve. Grön ens. de kommer från en Kandidat i meteorologi (återkallarna). Rött för inlämnat direkt till Meteor. i forum "Fjärrsens" i övrigt. (återkallarna).				HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT
<b>Passive sensing</b>	Explain how passive sensing systems are used to provide digital data from remote radiation (for example, in the visible, infrared and microwave parts of the spectrum).	Fjärrsens		HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT	Kallman PjaffHäls för upp. data under PMU - radar och satellit, 12 fullspår från meteorologiska data från Uppsala (återkallarna)	Grön för SMHI. Uppgåve. Grön ens. de kommer från en Kandidat i meteorologi (återkallarna). Rött för inlämnat direkt till Meteor. i forum "Fjärrsens" i övrigt. (återkallarna).				HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT
	Describe how data from passive sensors are used to derive information such as temperature, humidity, atmospheric composition, lightning, wave height and precipitation.	Fjärrsens		HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT	Kallman PjaffHäls för upp. data under PMU - radar och satellit, 12 fullspår från meteorologiska data från Uppsala (återkallarna)	Grön för SMHI. Uppgåve. Grön ens. de kommer från en Kandidat i meteorologi (återkallarna). Rött för inlämnat direkt till Meteor. i forum "Fjärrsens" i övrigt. (återkallarna).				HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT
<b>Micro-meteorological resolution</b>	Describe the orbital characteristics of geostationary and low-orbit satellites and use for meteorology, including the benefits, limitations and applications of data derived from these platforms.	Fjärrsens		HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT	Niklas Elmvik tar upp. data under PMU - satellit, de övriga från meteorologiska data från Uppsala (återkallarna)	Grön för SMHI. Uppgåve. Grön ens. de kommer från en Kandidat i meteorologi (återkallarna). Rött för inlämnat direkt till Meteor. i forum "Fjärrsens" i övrigt. (återkallarna).				HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT
	Describe the characteristics, limitations and applications of common channels available from satellite sensors, including visible, near-infrared, 4-umstar and difference.	Fjärrsens		HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT	Niklas Elmvik tar upp. data under PMU - satellit, de övriga från meteorologiska data från Uppsala (återkallarna)	Grön för SMHI. Uppgåve. Grön ens. de kommer från en Kandidat i meteorologi (återkallarna). Rött för inlämnat direkt till Meteor. i forum "Fjärrsens" i övrigt. (återkallarna).				HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT
	Explain the reasons for combining channels, including by creating RGB images.	Fjärrsens, Framstyrtman		eventuell HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT	PMU - Satellit					HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT
	Explain the applications of the imagery, on the advanced forecasting "channel images".	Fjärrsens, Framstyrtman		eventuell HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT	PMU - Satellit					HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT
	Select critical "or" multiple-channel imagery to observe common features of interest, including specific clouds and structures in other systems and forecast output.	Fjärrsens, Framstyrtman		eventuell HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT	PMU - Satellit					HO4005 - Atmosfärsstruktur 15 hp, 6-3 HT

## **Så här står det i BIP-M instruktionerna:**

“The priority is for each institution to develop a programme of study that takes account of the prior knowledge of the participants, the best way to structure the programme to meet local requirements, and the purpose of the overall programme of study which may go beyond what is needed to satisfy the learning outcomes specified here.”

# Anställningsförfarande

- Anställningskrav
- Utdrag ur Ladok
- Kontroll av utbildningsansvariga
- Ställningstagande