

Organizations involved in creating a "Weather Ready Globe"

Weather & Water Related Organizations				
Beneficiary	National Meteorological Services	National Meteorological Societies	HydroMet Equipment Industry	World's Least Developed & Developing
Financed by	UN	Donations (Volunteer-Based)	Industry	World's Richest Nations

IFMS VALUE PROPOSITION

1. **IFMS Uniting and coordinating the activities of National Meteorological Societies (NMSocs) & Associated Societies**
2. **Creating S&T Collaboration between NMSocs**
3. **Creating capacity through Webinars, Education & Training**
4. **Assisting in creating new Societies**
5. **Helping NMSocs in understanding new concepts such Global Weather Enterprise, WMO-OCP Global Campus & WB-GWEF, etc.**
6. **Sharing Best Practices, guiding Certification/ Accreditation Processes,**
7. **And much more – Visit: www.ifms.org**

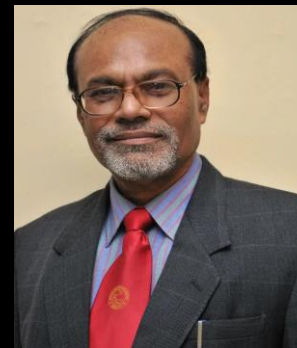
IFMS Webinar #5 on Education & Training COMET On-line Training Programs January 29, 2021



**FEATURED
SPEAKER**

Dr. Elizabeth Page – Director COMET PROGRAM

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**Dr. Sushil Dash
IFMS Chair – E&T and Webinars**

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**Dr. Harinder Ahluwalia
IFMS Chair**



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STRONGER Together



“Unity is strength...when there is teamwork and collaboration wonderful things can be achieved “

Maria Szponwick

IFMS BRINGING NMSOCs TOGETHER TO
LEVERAGE EACH OTHER'S STRENGTHS

Coming together is a **beginning**,
staying together is **progress**,
and working together is **success**.

- Henry Ford

Goalcast



WMO

Agenda For the E&T Webinar – COMET

Dated Jan. 29, 2021

- 1. Welcome to attendees by Prof. Sushil Dash**
– Chair E&T & Webinars Committee **5 minutes**
- 2. Presentation by Dr. Harinder Ahluwalia – President IFMS**
on IFMS approach to assist WMO & WB in
Capacity building through Education and Training **20 minutes**
- 3. Introduction of Dr. Elizabeth Page**
– Director COMET (UCAR) **30 minutes**
- 4. Q&A Session moderated by Prof. Sushil Dash** **30 minutes**
- 5. Announcement for the GCI Webinar on**
February 17, 2021 & Conclusion – Prof. Sushil Dash **5 minutes**

Actions speak louder than words!

**Role of IFMS in assisting WMO & WBG:
In Capacity Building through E&T**

**Presented by:
Dr. Harinder P. S. Ahluwalia
President IFMS**

*There is no point in dreaming if we
do not work hard to Make it
happen! .*

Organizations involved in creating a "Weather Ready Globe"



National
Meteorological
Services

Financed by
United Nations



National
Meteorological
Societies

Financing being
Sought



HydroMet
Equipment
Industry

Financed by World's
Richest Nations



World's
Least Developed &
Developing Nations

Industry

Teamwork
makes the
dream work



**International Forum of
Meteorological Societies**
**uniting National Hydromet
Societies**





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Introducing International Forum of Meteorological Societies

Uniting Meteorological Societies of the World

**The Role of the IFMS in assisting WMO & WBG in
Creating Capacity through E&T**

Presented By

Dr. Harinder P. S. Ahluwalia

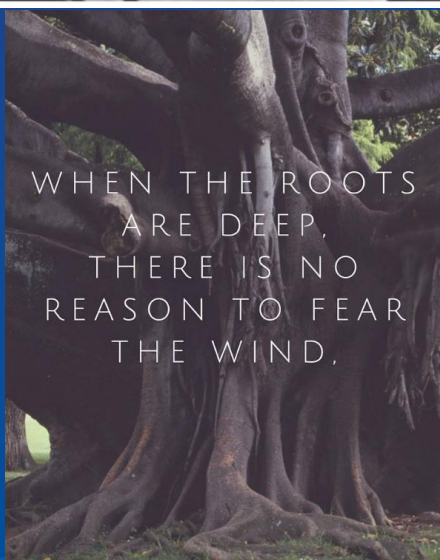
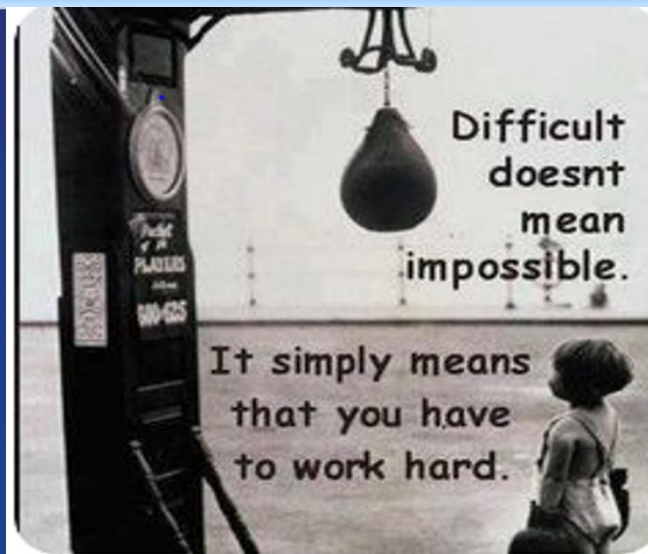
President IFMS

29-January-2021

I believe ...

No Excuses.....

IF IT IS IMPORTANT
TO YOU, YOU WILL
FIND A WAY.
IF NOT, YOU'LL FIND
AN EXCUSE.



A RIVER
CUTS THROUGH
A ROCK
NOT BECAUSE
OF ITS POWER
BUT ITS
PERSISTENCE



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Presentation Outline

- 1. IFMS and its mission to create collaboration between Societies – including in E&T and S&T.**
- 2. IFMS Approach to assisting WMO and WBG in creating Capacity through Education and Training (E&T).**
- 3. IFMS mission to educate and convince National Governments and Public for more investment in Meteorology & Hydrology field to safeguard Society at large from the effects of disasters.**
- 4. Conclusions.**

Capacity Building to Create a Weather Ready Globe

1. To reduce Global Warming and Climate Change (**GW&CC**), we need to reduce emissions and abide by International Accords e.g. Paris Accord.
2. However, GW&CC is happening, hence we need to **create a Weather Ready Globe** i.e., we need to build capacity in the following areas:
 - a) *Infrastructure – at least a basic infrastructure*
 - b) *Education & Training – Technology Related*
 - c) *Adequate institutional and societal capacity.*



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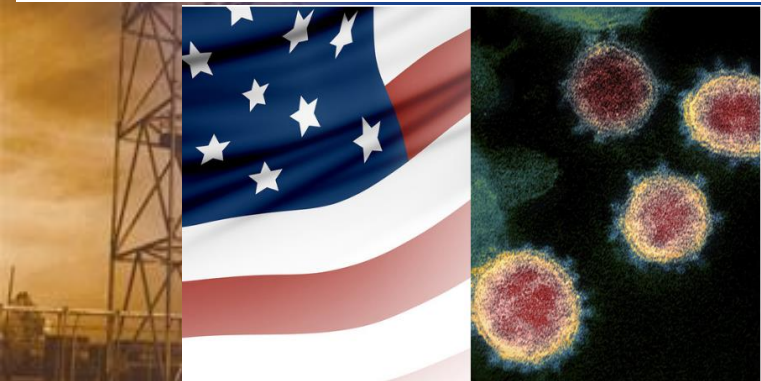
Reactive vs Proactive When you are not & When you are prepared



quake in Iran-Iraq ...



Earthquake proof buildings- where are ...



**Disaster response expert
explain why the U.S. wasn't
more prepared for the
pandemic**

Capacity Building

1. **Infrastructure:** It is the responsibility of each nation
2. For those countries which cannot afford to spend on even minimum infrastructure, organizations like **World Bank, Regional Development Banks, etc.** are assisting through loans and grants.
3. Capacity Building in terms of Education and Training (E&T) as well as through **cooperation between NMHS of nations** are supported by **WMO** and other multinational organizations.
4. **Institutional and Societal capacity building** is the job of **National Governments** and philanthropic organizations.
5. Organization like National/Regional Meteorological Societies and **IFMS** can assist in all of the above through volunteers once they are fully supported and developed.



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Activities of NMSoc

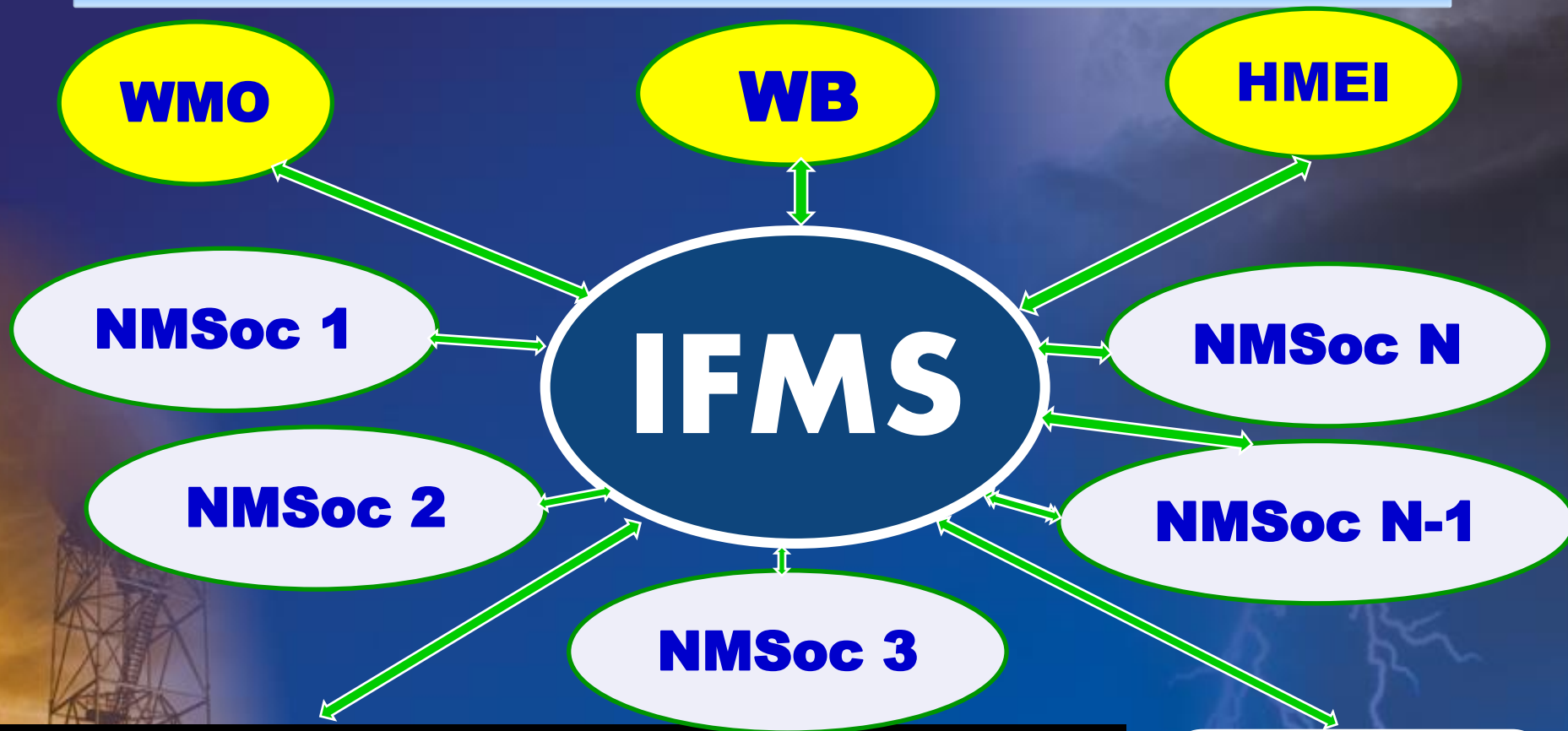
A "Society" can do what individuals can't

1. Provide a sense of "belonging to a family" to practitioners,
2. Create Collaboration between its members & also other Societies,
3. Training Programs for Capacity Building,
4. Create and use Best Practices,
5. Develop Accreditation Certification and related Training,
6. Organize Conferences,
7. Organize Funding,
8. Desire to have relationship with WMO,
9. Keeping abreast with WMO and WB Initiatives about PPA Collaboration Initiative, Global Campus Initiative, etc.
10. Imagine doing all that by yourself Hence the importance of IFMS and Regional Meteorological Societies.

IFMS – the Glue between Professionals of different Countries



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Membership includes NHMSocs, Regional HMSocs, Specialized Societies such as AGU, ISB, IAUC, IABM, IAMAS, etc..

Regional Met Societies
e.g. EMS, FLISMET,
etc.



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IFMS – Assisting in Capacity Building through E&T

- As **Covid19** has shown, unpreparedness for calamities, whether natural or man-made, can cause great disruption in social life on top of loss of life and economic development.
- A very important **part of preparedness is capacity building** in all countries – especially in Developing and Least Developed countries - through Education and Training (E&T).
- World Meteorological Organisation (**WMO**) plays a very **important role** in the area of above capacity building.
- However, due to the vastness of this task and limited resources, **WMO can use assistance of other organizations such as IFMS**, which can provide assistance through its **member Societies and volunteers**.



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Need for Training...

For more than just professionals

- E&T related to climate change issues **must not be limited to the professionals** working in meteorology and students in educational institutions and researchers in research organisations.
- All stake holders need to be educated adequately to understand the contribution of human beings to the climate change, take appropriate measures to adapt to the situation, make proper policies to safe guard the society, make adequate scientific progress to deliver early warnings, etc.
- Appropriate E&T should also be imparted to the general public, school teachers and students, policy makers, administrators and stake holders in the fields of agriculture, human health, tourism, fishing industry, etc.



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Training Resources

- **NMHS would like to train their staff on a regular basis.**
- But Developing countries (**DC**) & Least Developed (**LDC**) ones find it hard.
- **WMO has several Regional Training Centres (RTC) set up for the benefit of cluster of nations.... But limited T&L resources**
- In the recent years, it has been felt that with the **advancement** of weather instruments and climate science, the **training material and methods need to be upgraded appropriately.**
- From that perspective, the **Global Campus Initiative (GCI)** has been born.
- **GCI also encourages the RTCs to collaborate with other educational and research organisations.**

Impediments to Training ...Training Resources

- Availability of **sufficient number of Trainers** with strong knowledge of subject matter.
- **Cost of attending training programs in terms of T&L expenses and amount of time required.**
- Situations like the present one **Covid19** – can make it almost impossible to travel.



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Important Developments for Imparting Training

- All member societies would like to organise some programmes from time to time depending on their resources and availability of volunteers.
- It is the most opportune moment for IFMS to help its member societies go through some essential educational and training programmes in a coordinated way.
- The present Covid19 situation has opened the flood gates of online programmes.
- Such online programmes can reach large number of participants with little or no cost and can also provide them learning material at ease.
- Large number of online learning materials are available at different sites. Some are very popular sites such as COMET, MOOC (Massive Open Online Courses) by several universities, AMS, RMetS etc.
- Even instructor led training is possible through on-line means.



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IFMS Approach to assisting WMO in the Field of E&T

- How many of you know what material is available on various sites
- Our objective: Ensure to help as many people as possible to learn from the courses available on the identified websites.
- To start with, IFMS can make a central repository of Training Material, an important contribution to effort of WMO and WB.
- Our first activity is to define the categories of courses which will be helpful in training various classes of people *e.g. Forecasters, Briefers, Disaster Management groups, Infrastructure, Processing Systems, Teachers, Students, Public and Government.*
- Next activity is to identify all existing E&T courses and mechanisms available in above categories. *Readers are requested to suggest other categories of Courses we should include*

Offer your services for this noble effort.



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IFMS Approach ...cont'd

- Perform Gap Analysis between what is available and what is required.
- A part of this will be achieved by providing the results of our investigations to our **member societies and asking them to identify what they feel should be added.**
- After the Gap Analysis, we will decide **what to do about the gaps** depending upon the available resources to us.
- We will collate the above work into a comprehensive document **clearly identifying what is available on-line and what is not but can be easily put online.**
- Identify courses available through Regional Training Centres (**RTC**).
- If we need to develop courses, based on the Experts available to us, we will need to assign priority on the sequence of the courses to be developed. All this material will be made available to all our member societies and any other qualified interested parties.



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IFMS Approach ...cont'd

- Public Education and Government Awareness are quite important for increasing the government support for additional financial and manpower resources for Capacity Building.
- In addition, **Teacher and Student Training Courses** will also be identified and gaps filled by developing missing courses based on available resources.
- **Cooperative development of E&T material as opposed to each society working on its own is the key to success.** We expect to distribute the required tasks among our member societies.
- Some of the **Life Members of the Indian Meteorological Society (IMS)** have very kindly accepted to lead this effort.
- Some IFMS Council Members are also a part of this Committee.
- However, we **need a number of additional experts** in areas discussed above and achieve more success - more expert volunteers offer their services, more we can achieve.



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IFMS is grateful to the following E&T Expert Volunteers



**Prof. S.K. Dash, Chair
E&T Committee
Retd. Director CAS-IIT**



**Mr. Ramesh Bhatia
Past President IMS &
Retd. DG-IMD**



**Dr. Harinder Ahluwalia
President IFMS**



**AVM Dr. Ajit Tyagi
Past President IMS &
Retd. DG-IMD**



**Prof. Elizabeth Bentley
IFMS -Region 6 Rep.
CEO Royal Met Society**



**Dr. Rattan Datta,
Director at MERIT
New Delhi**



**Dr. Someshwar Das,
Director at MERIT
New Delhi**



**Dr. L. S. Rathore
Past President of IMS &
Retd. DG-IMD**



**Mr. Michael Martens
IFMS -Region 5 Rep
President NzMS**



**Mr. Narayan Gautam
Asst, Professor
Tribhuvan University, Nepal**



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Important Points to keep in mind

- Any Training material we prepare will be **modular in nature** so that after going through certain fixed number of predefined modules, students gain sufficient knowledge in a particular area of the subject.
- A short **self-evaluation exercise** will also be provided after completion of lessons/modules of a particular subject studied. This approach will provide an opportunity to the students to make an assessment of their level of absorption of material contained in the modules.

Type of Courses

1. Teachers and Students Training
2. Government & Public Awareness of Weather and Climate Disasters & their causes
3. Numerical Weather Prediction
4. Satellite Data Use
5. Data Collection Infrastructure
6. Processing and Display Systems.



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Students & Teacher's Training

- **Children are the future of the society** and teaching them the conventional science courses such as physics, chemistry, mathematics, geography, environmental science from the **point of view of climate science**.
- **Teachers are the backbone of any society** and they are the main source of learning for the students. Hence, **training the teachers** will have cascading effect.
- **Science and Geography teachers in schools will be ideal for weather and climate related topics.**
- These initiatives need to be supported by National Governments; e.g., **IMS is being assisted by the MoES.**
- IFMS will identify the **freely available learning sites** related to teachers and students and make those available to all its member societies.



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Exposure to Numerical Weather Prediction

- Today, **objective weather forecasting at all time scales** and climate projections are usually based on the output from Numerical Weather Prediction (**NWP**) models.
- For giving better operational forecasts, in addition to output from a number of models in **ensemble mode**, forecasters also use their own **subjective experiences**.
- Although Global models need High Performance Computing (**HPC**) – **output is freely available**.
- **Not every nation needs to run global model.**



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Satellite Data Use

- Meteorological data obtained from weather satellites plays a very vital role in all real time weather forecasting systems used worldwide.
- **More than 90% of data input to the systems comes from satellites.**
- Satellite images give true pictures of the weather and climate at every point on the globe and these can explain various atmospheric phenomena very easily.
- **Therefore, proper training on use of satellite data in weather forecasting is of utmost importance.**
- This is an area involving a very high level of technology. It is necessary to build up a very strong base of fundamental principles involved in satellite meteorology starting with the very basic levels.

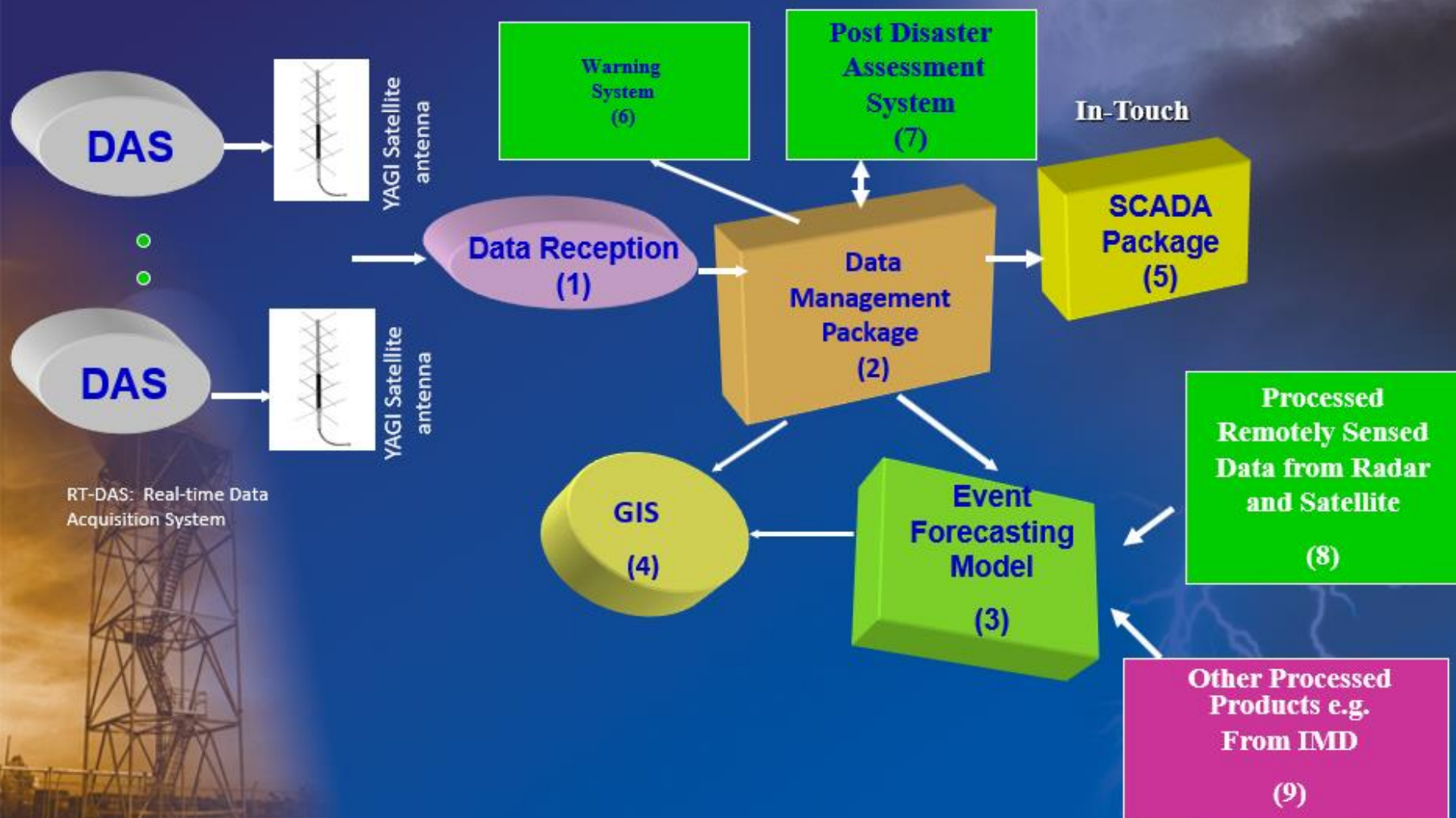


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Disaster Forecasting & Management

- Studies have shown that disasters either natural or manmade are on the rise. It is one of the challenging phenomena especially for developing countries.
- Various relevant institutions/stakeholders have been significantly contributing to reduce disasters in their regions.
- However, it is expected to achieve significant improvements in disaster management with collaborative efforts.
- In this case, a remarkable initiation is planned by IFMS to enhance E&T in disaster management especially in water and/or climate induced disasters.
- IFMS will play a considerable role like an 'umbrella' of various meteorological societies in the world.

Disaster Forecasting & Management...cont'd





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Data Collection Infrastructure

- In addition to training on the usage of all types of data to do weather forecasting, it is also important to understand the infrastructure required to collect the required data and identify the sources from where this data can be obtained.
- There needs to be a course on various levels of infrastructure required for obtaining data e.g. most basic infrastructure requirements (collection of hydromet data through Automated Weather Stations equipped with sensors),
- Satellite data sources, NWP data sources, etc. Additional types of data require additional investment in infrastructure; for example, one has to purchase Radars, Lightning Detection Network (LDN) and Radiosondes network.
- More sophisticated NMSs also install additional sources of data such as Radiometers, Wind Profiles, etc. A course on infrastructure would go a long way in improving weather forecasting.



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Data Collection Infrastructure

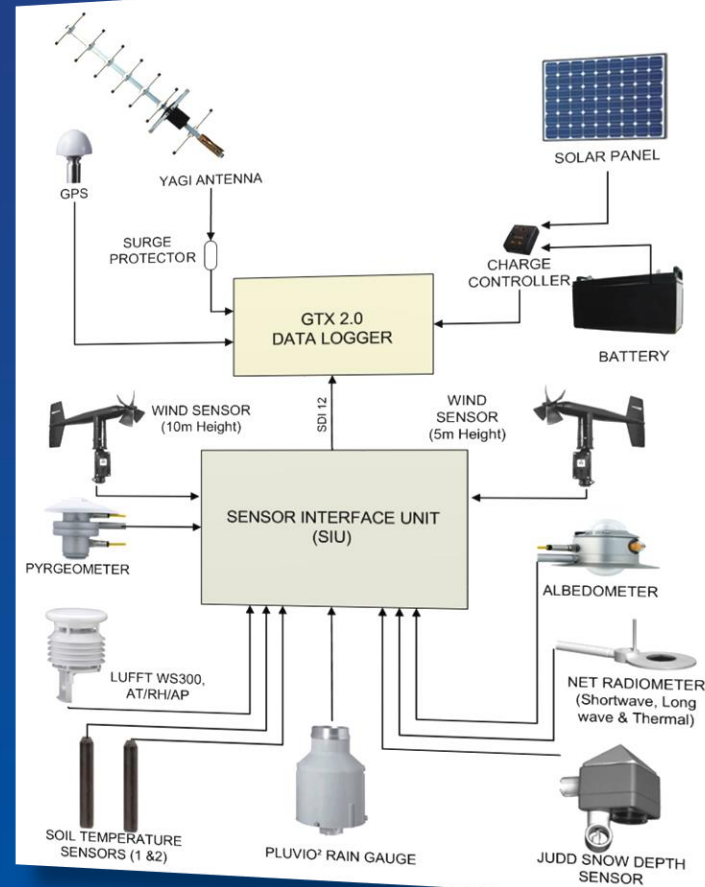
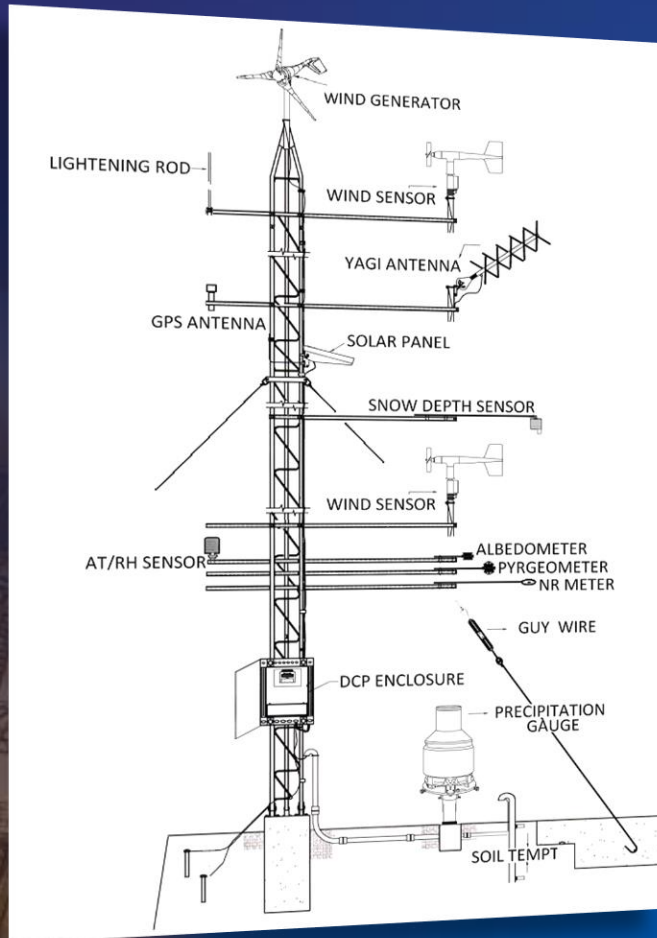
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Solar Radiation & Photonic Sensors



Data Collection Infrastructure ...cont'd





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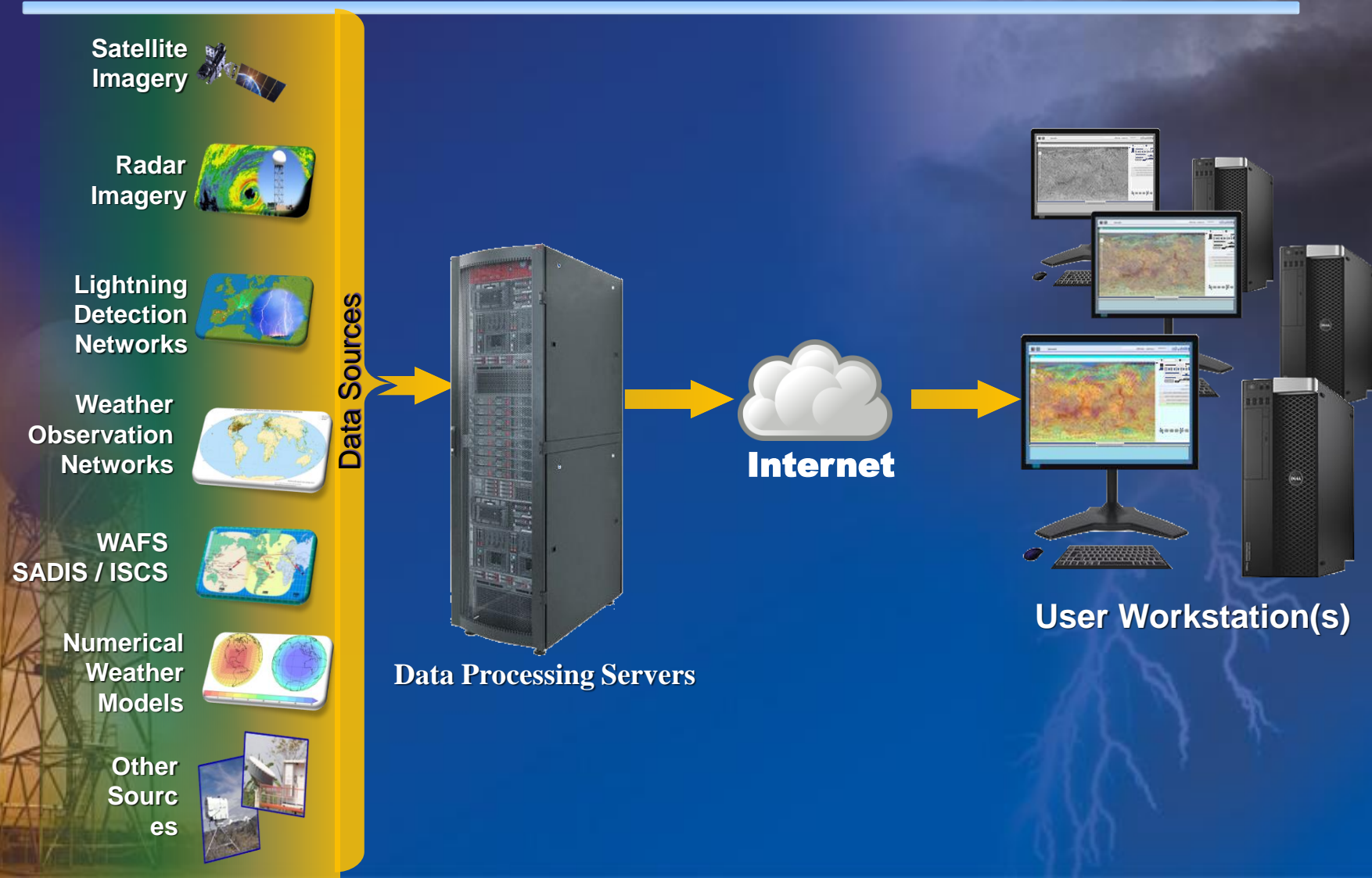
Processing and Rendering Systems

- Major centres of the world run **Global Models**, output of which is **available to Users world-wide**.
- Unless you are really large, Developing and Least developed countries do not need to buy High Performance Computers which are very expensive.
- A reasonable sized affordable Computer System is sufficient to run regional models or mesoscale models.
- That leads us to Processing and Rendering Systems.
- **This is the most crucial component of the system** because that is what the Forecasters use most – **rubber hits the ground**.
- That is the system which **collects and processes** all types of data (Alphanumeric, GRIB, BUFR, Satellite Imagery, Radar Imagery, LDN data, etc.), and renders it for the user.
- It provides capability to process and **display Satellite and Radar Imagery, Model Output, Significant Weather Charts, alphanumeric data and LDN data**. Therefore, training on the usage of such systems is very important.



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Example: Generic Configuration for Meteorology FWS





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Public Awareness of Weather & Climate Disasters

- Weather and Climate affect all sections of the society. **LDCs and DCs are highly vulnerable** to weather and climate extremes,
- **Public suffers loss of lives and livelihood** from devastation caused by tropical cyclones, floods, local severe storms, lightening, heat and cold waves, flash floods and landslides.
- The impact of **climate variability** and change on agriculture, water, health, energy and other climate sensitive sectors is going to pose **great challenge to society in the coming years.**
- Weather and climate science has made considerable progress and have developed capacities to monitor severe weather development in real time and to **issue warnings well in advance for public to take safety measures, e.g., UV is very high, don't expose skin in the sun.**
- Climate data and projections have been found useful in **developing climate resilience.**



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Public Awareness of Weather & Climate Disasters ...cont'd

- **Common man** does not understand **jargon and intricacies of weather forecasts**, climate science and impact of climate variability on their day to day life.
- We need to develop capability to **communicate with public in a simple manner** so that they are aware about disasters, their causes & public's role in mitigating the effect of disasters.
- We also need to **educate public** about the need to support our effort in **convincing Governments** to invest more.
- We have associate member societies and this case **IABM** – International Association of Broadcast Meteorologist can help us to **convey our message** in the most appropriate manner.



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Government Education

- Disasters cause a lot of **loss of life/property and disruption**.
- If a **fraction of that money lost in disasters** is spent on improving infrastructure and capacity, how many lives and properties will be saved?
- Sounds so **simple** but the message is not getting to the Govts.
- Vladimir Tsirkunov stated in IFMS-IGM6 in Boston that WB spends money in developing infrastructure in LDCs and once the project is over, the local government does not want to support maintenance.
- I have heard professionals state that their Govt. does not allocate money stating **you cannot change weather** 😊
- This only means we do not know what message & how we should convey it – **need to fine-tune our message**.

Conclusions

1. Education & Training on all aspects of **weather forecasting as well as Infrastructure** are the two of the most essential ingredients to fight against the Global Warming and Climate Change (GW&CC). Two most fundamental areas to be managed to achieve success are:
 - a. **Measures to reduce GHG to control Global Warming,**
 - b. **Given that Global Warming is happening, we need to build capacity to withstand the effects of Climate Change with least loss of life and property.**
2. **Governments of various countries are working on the reduction of GHG by having discussions and signing accords to reduce GW.**
3. **No such high level meeting on the second aspect - Protection.**
4. **WMO being an employee-based organization, cannot employ sufficient manpower to solve the Training Riddle by itself.**
5. **Let's assist WMO and the WB in Building Capacity through Education and Training (E&T) and providing any advice in building infrastructure through our expert volunteers.**



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Conclusionscont'd

- In addition to providing training to professionals, it is important to **educate Governments and public** for not only supporting investment in NMSs but **also in NMSocs**.
- **How we are going to achieve it? That is where retired & also active professionals come in.**
- We need to devote our **time, energy and also donations** to save this planet to be able to leave it intact for our future generations.
- **NMSocs can play an important role but many countries do not have such societies.**
- You can see the power of **professionals getting together to collaborate** by looking at countries which have such societies and now are **also benefitting from a family of these societies- IFMS – to avoid duplication of effort by sharing.**

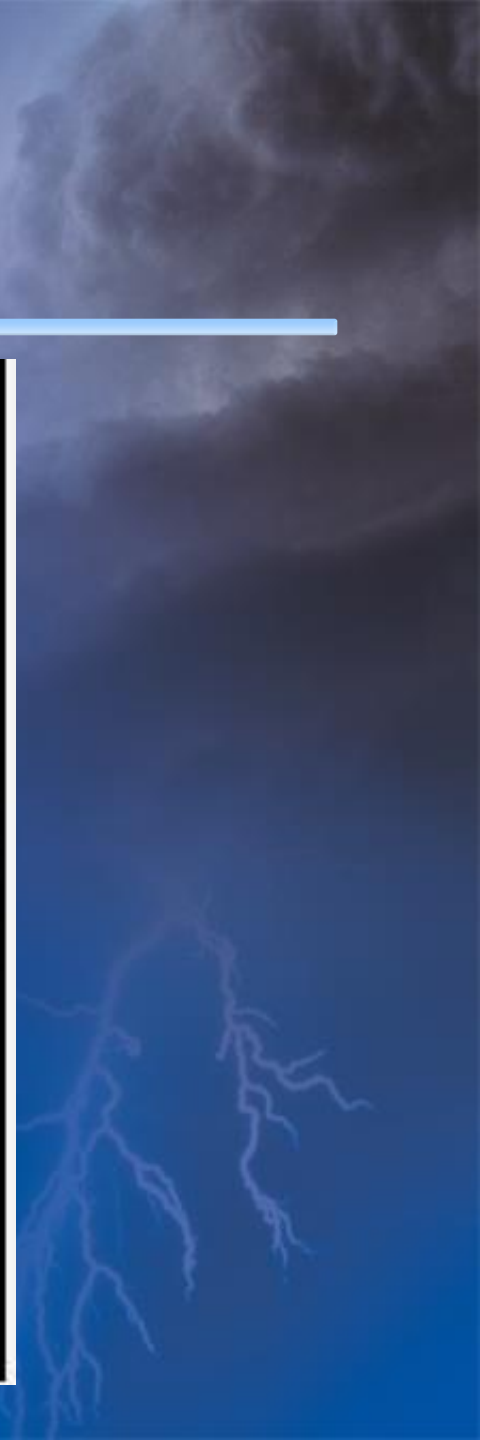
IFMS

**A Great Gift any NMHS can give
to its Nation is it ...Taj Mahal?**



IFMS

Is it ...Moon?



IFMS

Is it ... Planets?





IFMS

It is...the

NATIONAL METEOROLOGICAL SOCIETY

Being a part of a fraternity is extremely fruitful.....

Giving back to the world what we got from it is the most satisfying feeling

IFMS

Offer your Services as Volunteers



Don't expect others to do it



Offer yourself as Volunteers



"The limits of the possible can only be defined by going beyond them into the impossible."

--Arthur C. Clarke

**It's never crowded along
the extra mile.**

Wayne Dyer

And that is where success resides

What can you do for IFMS?

And so, my **fellow Americans**: Ask not what your country can do for you - ask what you can do for **your country**.

John F Kennedy

And so, my fellow **Professionals**: Ask not what your IFMS can do for you - ask what you can do for **your IFMS**.



I will move the world.....*Archimedes.*



Fulcrum: Finances

Rod: Volunteers

“Give me a lever long enough and a place to stand, and I will move the world.”

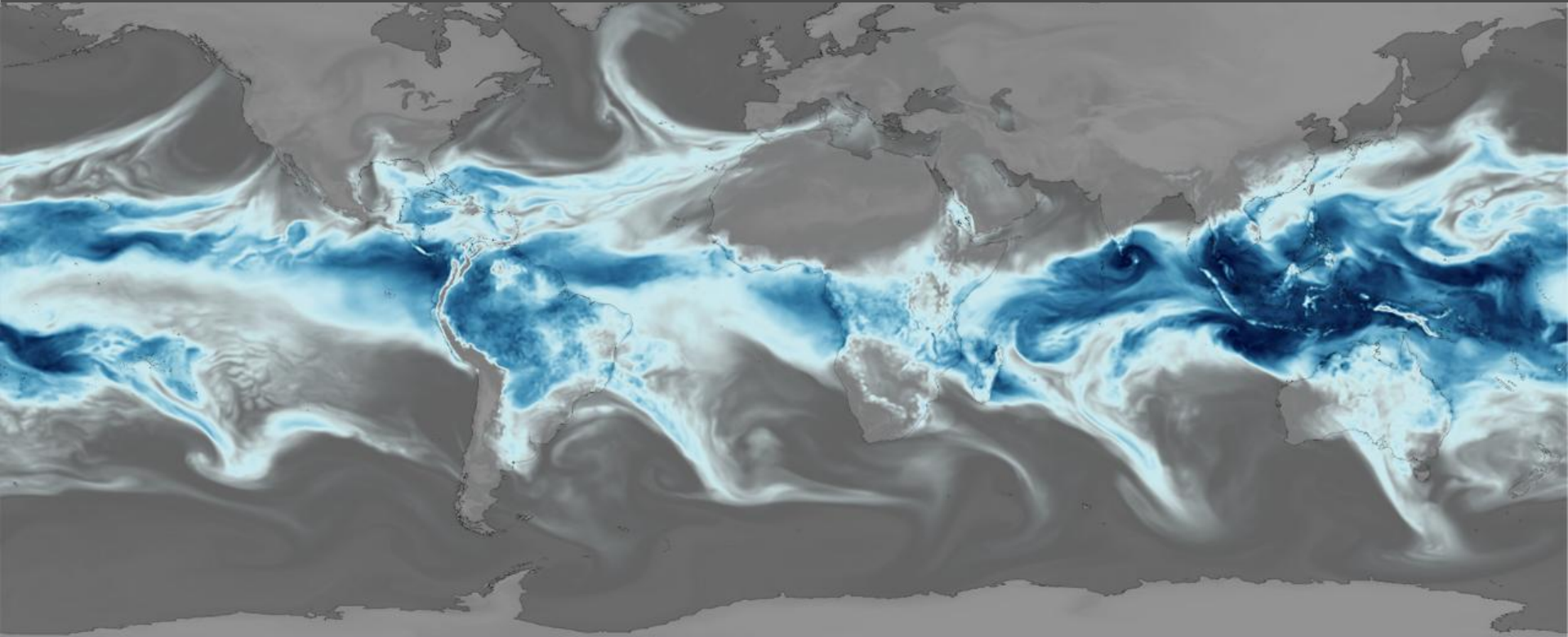
(Archimedes 230 B.C.E.)





COMET[®] Educational Resources and Applications for Building Training Capacity

Elizabeth Page | Winter 2020



- THE NEED -

30 years of geoscience training efforts in support of environmental forecasters



The COMET Program: Advancing geoscience workforce expertise worldwide

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Training & Education	Capacity Development	Outreach
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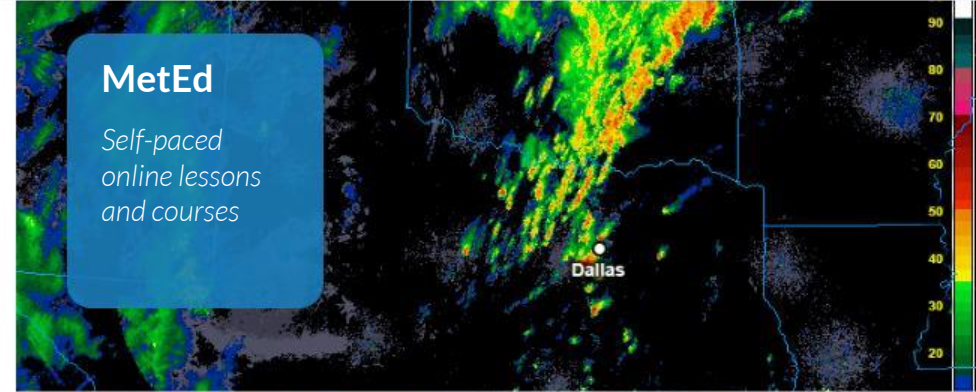


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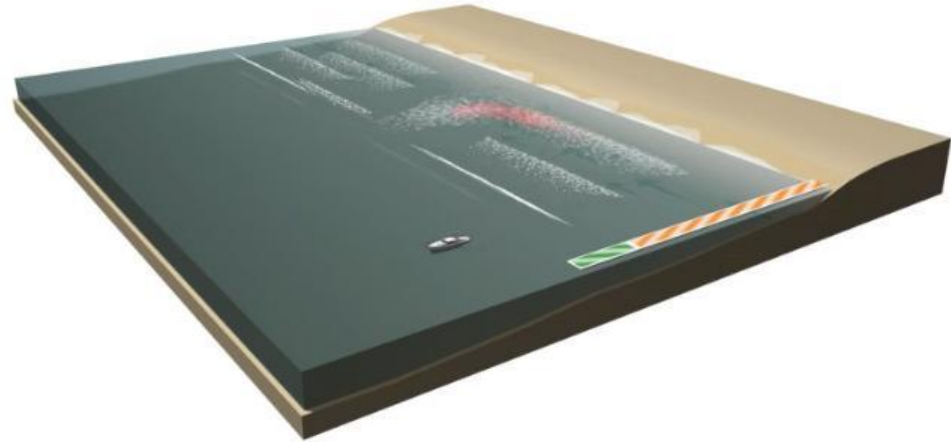


Met 101: Introduction to the World's Oceans

Learn to:
Summarize the factors involved in creating wind waves, swell, and tides.

[View animation](#)

Formation of Rip Currents



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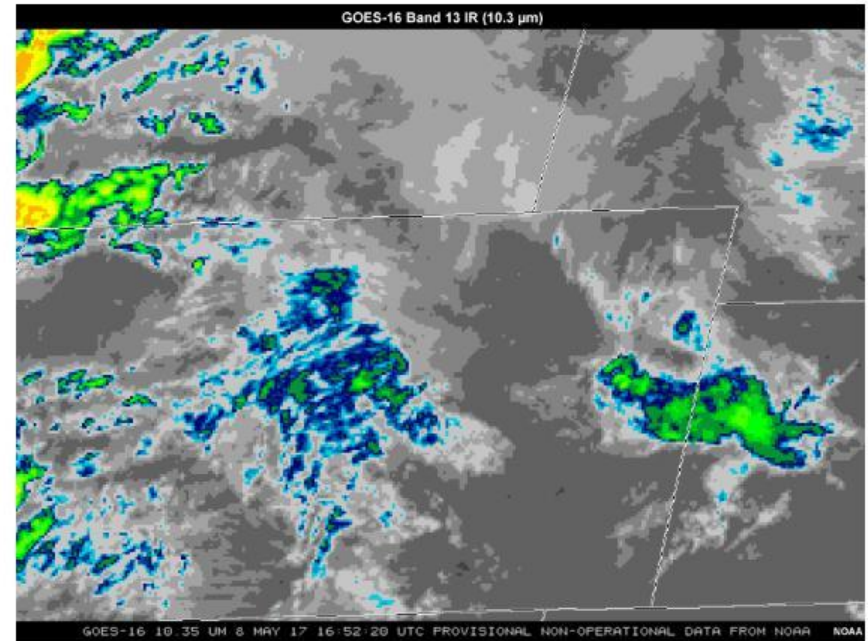
What can
you learn
on MetEd?



GOES-16 Case Exercise: 8 May 2017 Colorado Hail Event

Learn to:

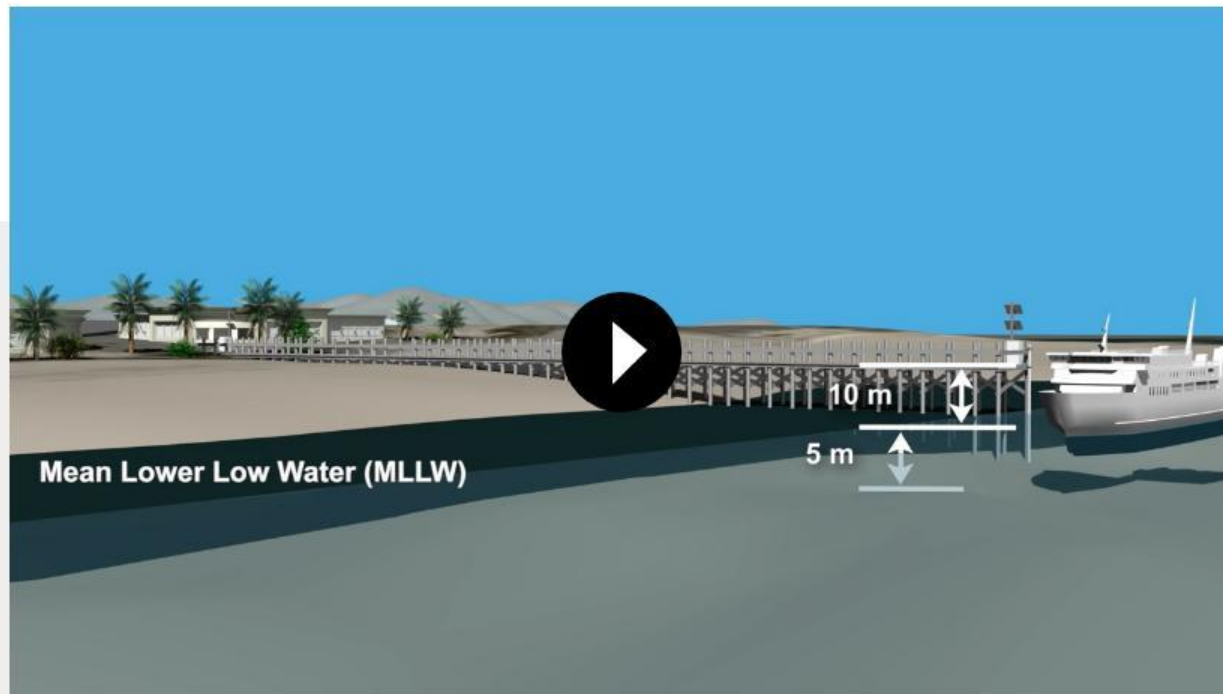
Identify common convective
development and intensity
signatures on longwave IR
and visible satellite imagery.



COMET YouTube

Short on time?

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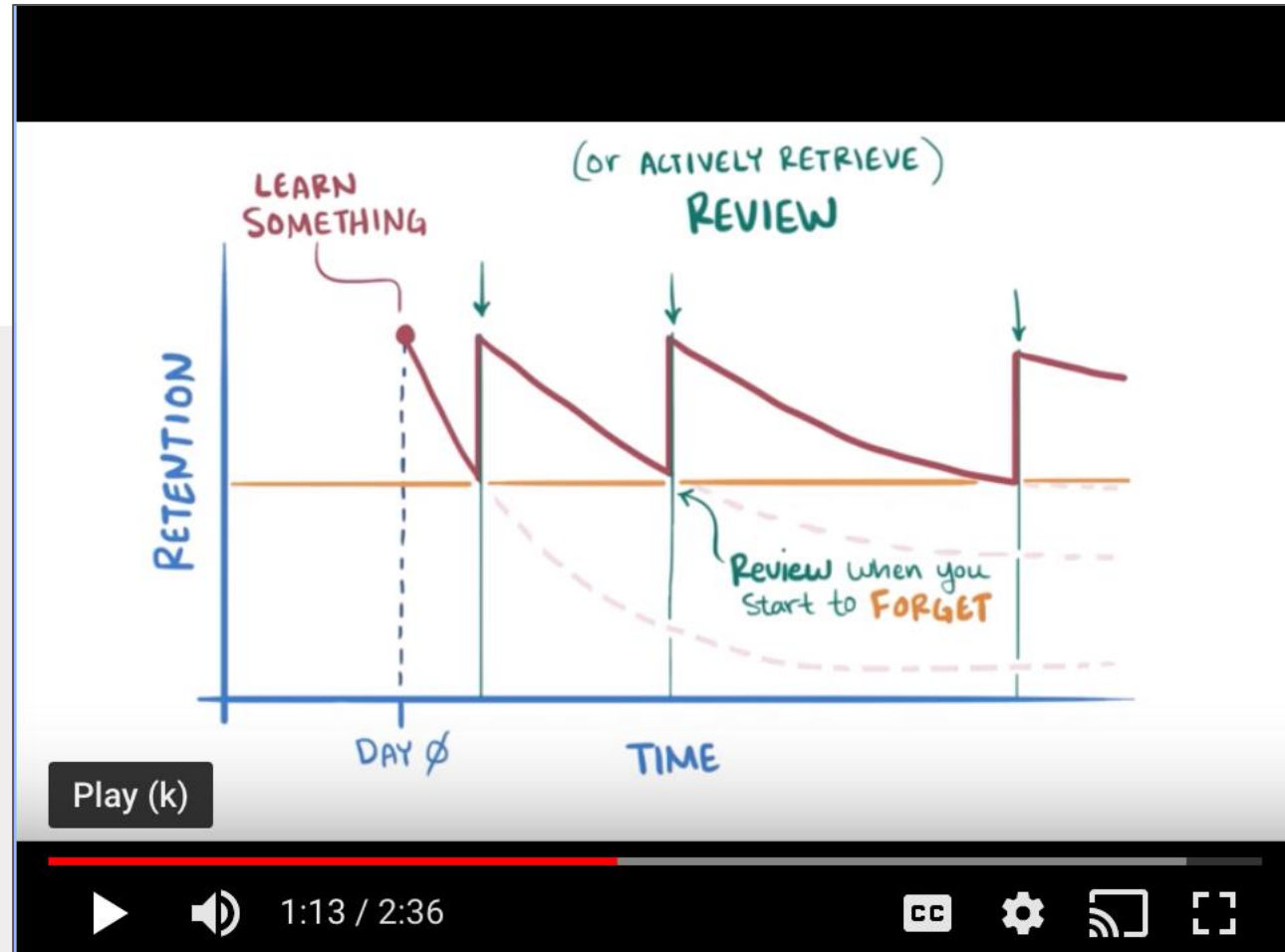
youtube.com/user/cometmeted

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CAPACITY DEVELOPMENT



COMET International Work

Projects aim to improve rural and remote communication of meteorological information.



3D-Printed Automatic Weather Station (3D-PAWS)

Expanding surface observations in remote areas

- Inexpensive, reliable stations with 3D-printed components
- Measurements: pressure, temperature, relative humidity, wind speed and direction, precipitation, light
- Run on Raspberry Pi single board computers
- Transmit surface observations in real-time to centralized data servers

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COMET Impact-based Forecasting

Projects aim to improve meteorological information.



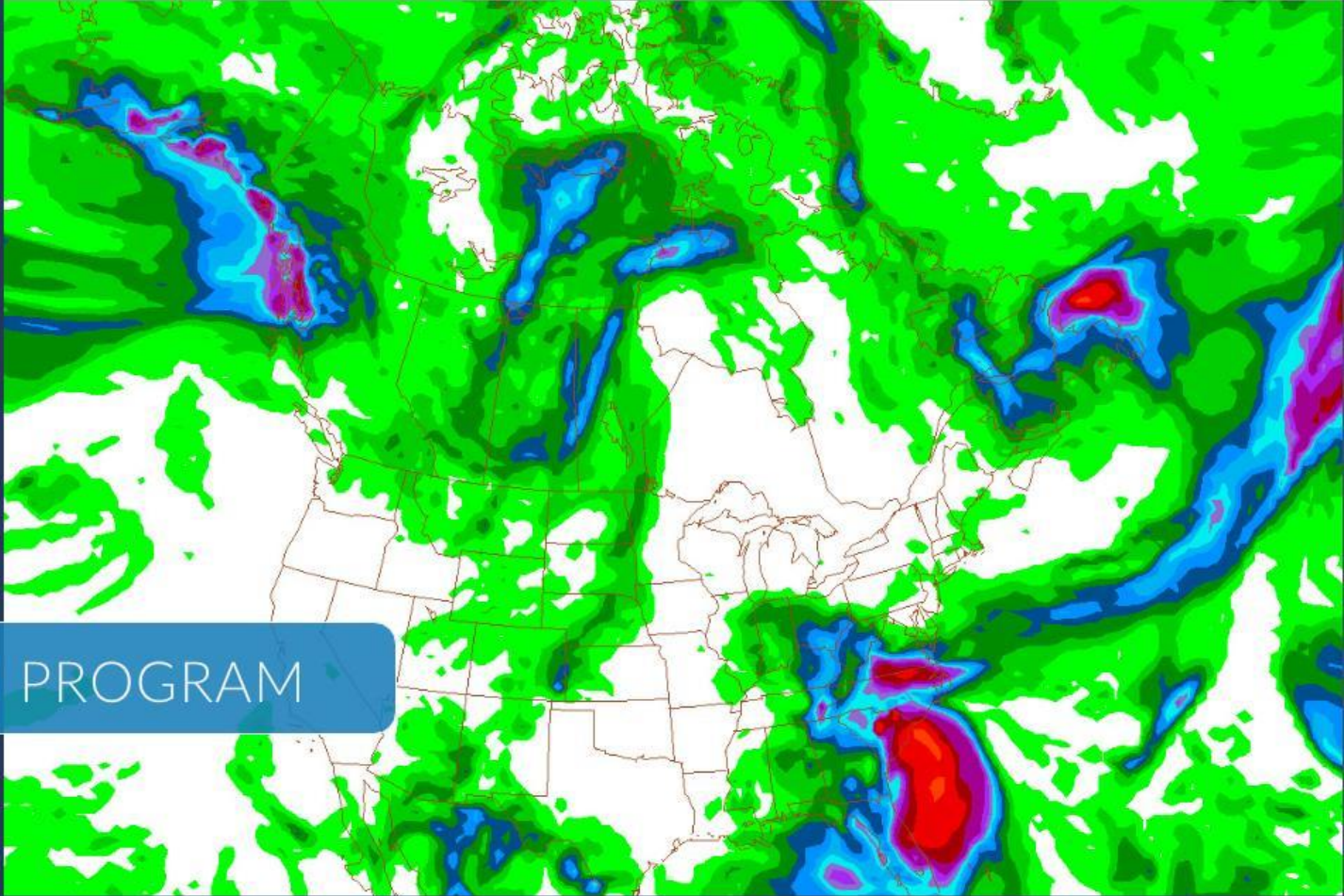
Weather Ready Nations (WRNs)

Supporting impact-based forecasting in Barbados and Central America

- Pilot project's partners: CIMH in Barbados, COMET, and the Hydrologic Research Center
- Training workshops in Barbados, Costa Rica, El Salvador, Guatemala
- Forecasts stress potential impacts to better prepare local communities for extreme weather, water and climate events

www.iepas.ucar.edu

OUTREACH PROGRAM



Outreach Program

Funding collaboration between NWS forecast offices and universities to promote the application of meteorological research.

Cooperative Projects

- 2-4 awarded
- 1-2 years in length
- Maximum award of \$60,000 per project
- May cover multiple topics
- Often involve multiple faculty and NWS forecasters

Partners projects

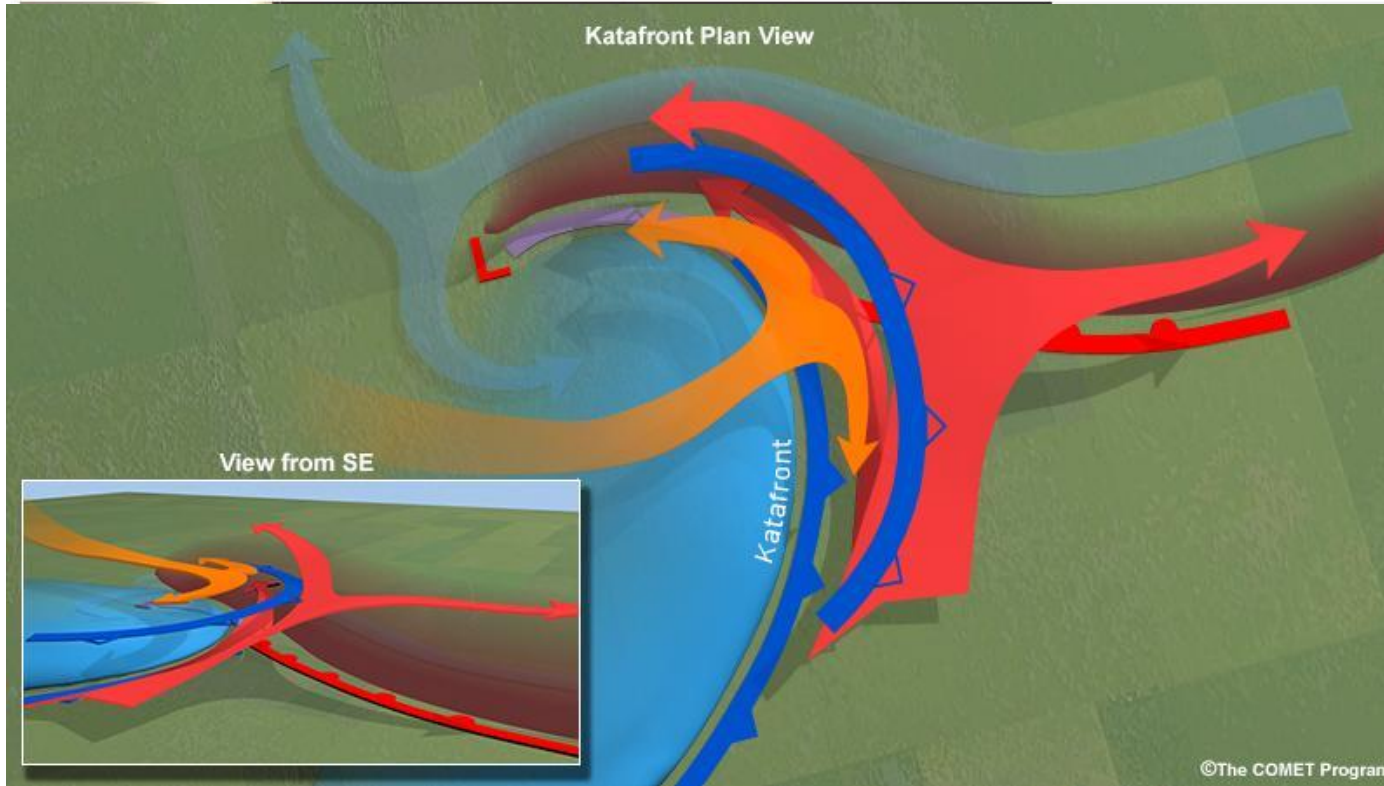
- 1 year in length
- Average university award is \$15,000
- Focus on a single topic
- Involve 1 faculty and 1 NWS forecaster

www.comet.ucar.edu/outreach

- FUTURE WORK -

INNOVATION

New ideas and ways forward



Virtual and Augmented Reality
Taking 3D visualization to the next level

Educational Games
Incorporating games into lessons

Tailored lessons
Using the pretest to tailor learning

Lab Support
Synoptic lab package

- IN CLOSING -

We are here to help!

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