2023 Michigan Airport Conference

MICHIGAN ASSOCIATION OF AIRPORT EXECUTIVES
MAAE

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MDOT
Michigan Department of Transportation
AERONAUTICS

Sustainability Through Accurate Weather Forecasting:

Michigan's Automated Weather Observation System (AWOS) Network

Michael Soper – Electronics
Facilities Unit – MDOT AERO
MAAE ~~Winter~~ Fall Conference 2023

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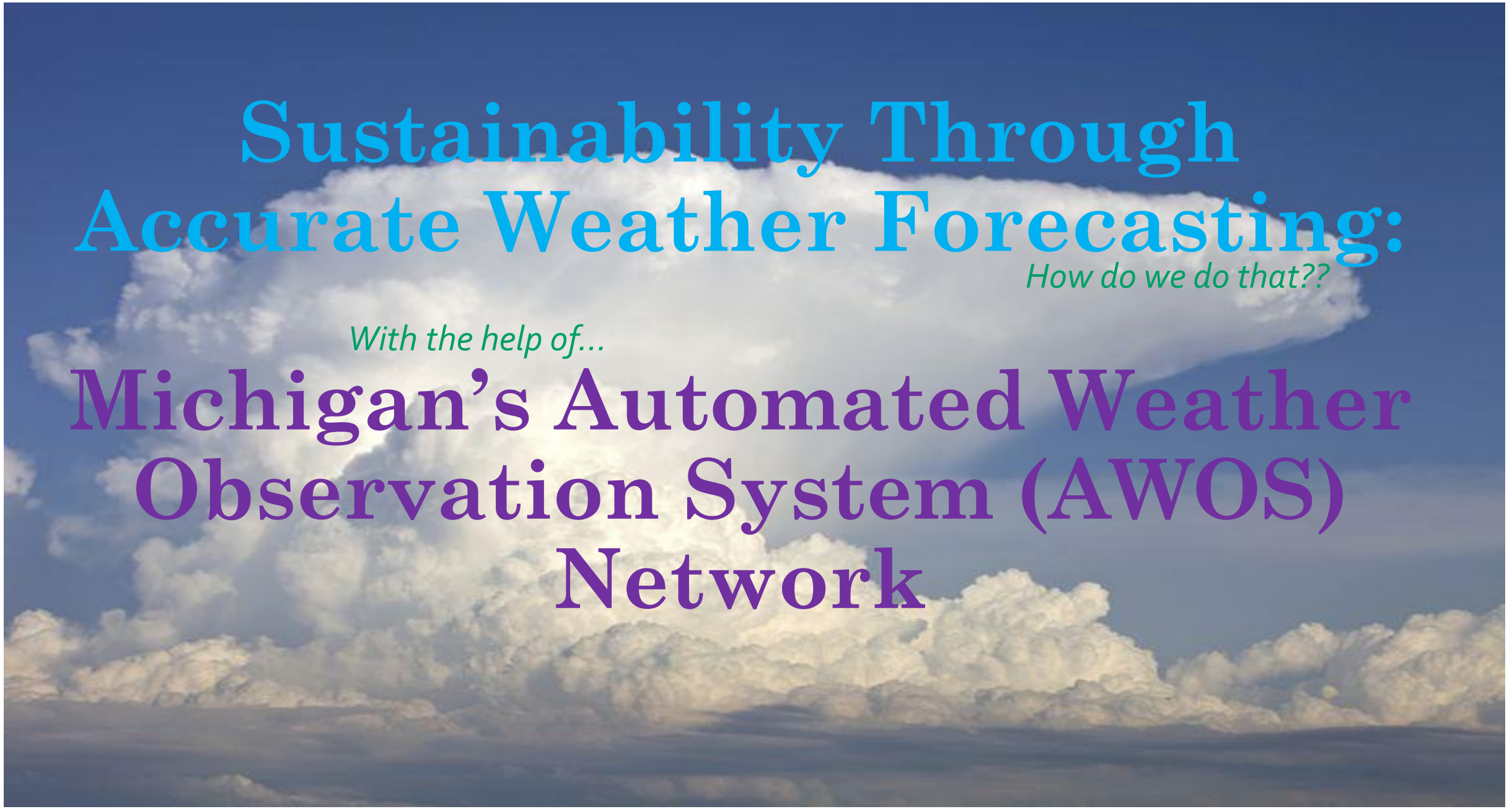

Sustainability Through Accurate Weather Forecasting:

How do we do that??

With the help of…

Michigan's Automated Weather Observation System (AWOS) Network

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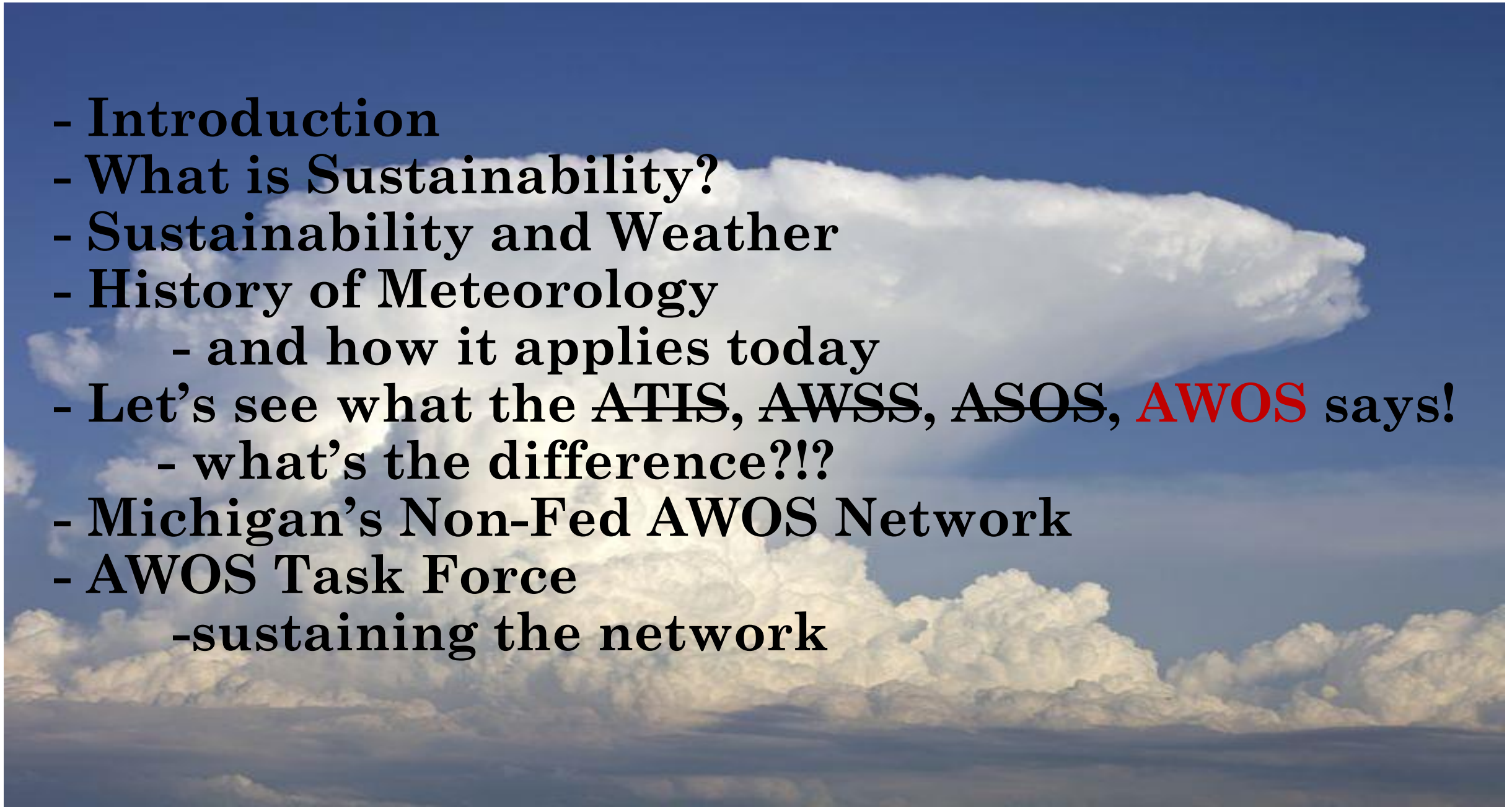

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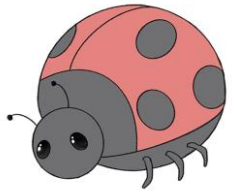
- Introduction

Hi! I'm Mikey!



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- Introduction

How does weather impact our lives?

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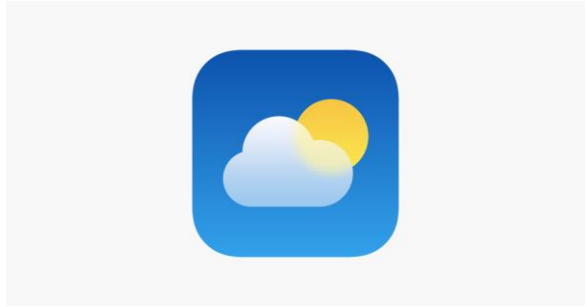
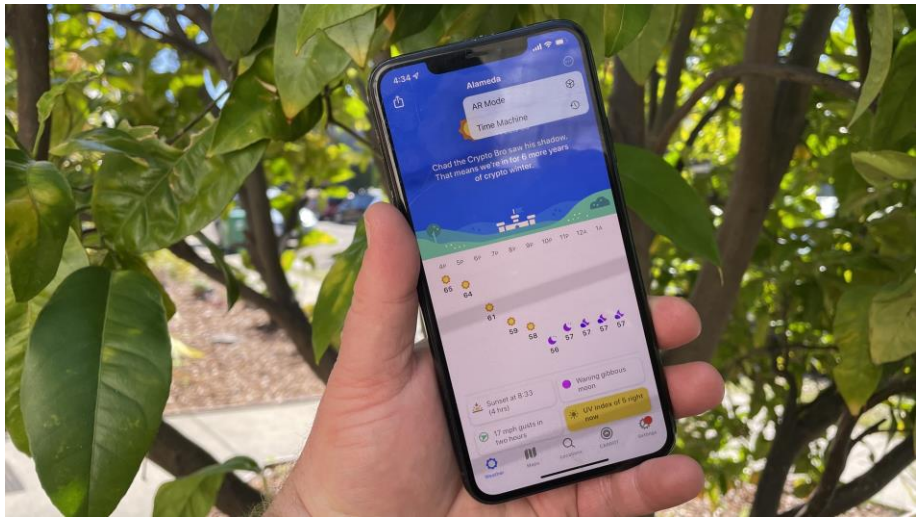
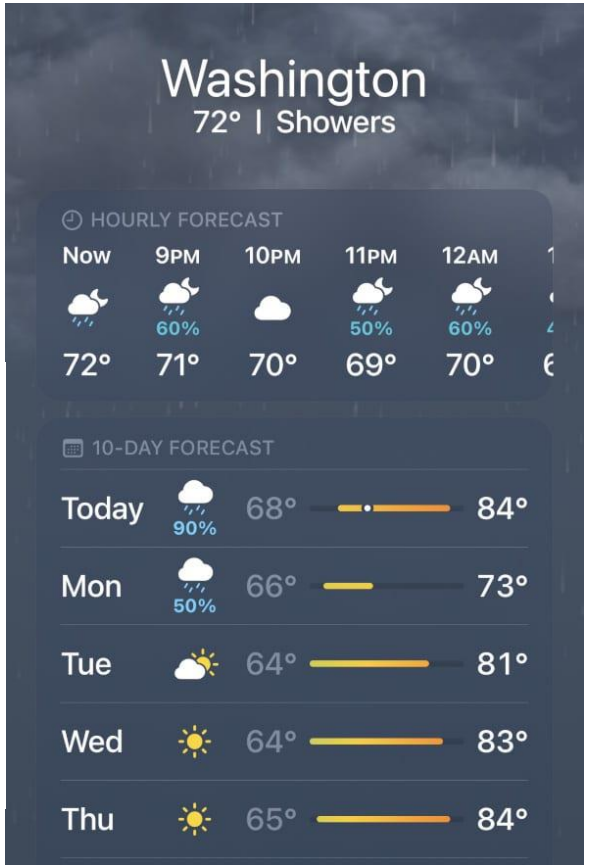
- Introduction

Do you have..., more than one?







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- Introduction

Question for you –
In what professions could you lie all day long and still have a job?

- Introduction

Question for you –
In what professions could you lie all day long and still have a job?

- What is Sustainability?

- What is Sustainability?

The ability to be maintained at a certain level

Avoidance of the depletion of natural resources in order to maintain an ecological balance

Meeting our own needs without compromising the ability of future generations to meet their own needs

3 Pillars:

1. *The Economy (profit, $)*
2. *The Society (people, safety)*
3. *The Environment (planet, nature)*

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- Sustainability and Weather

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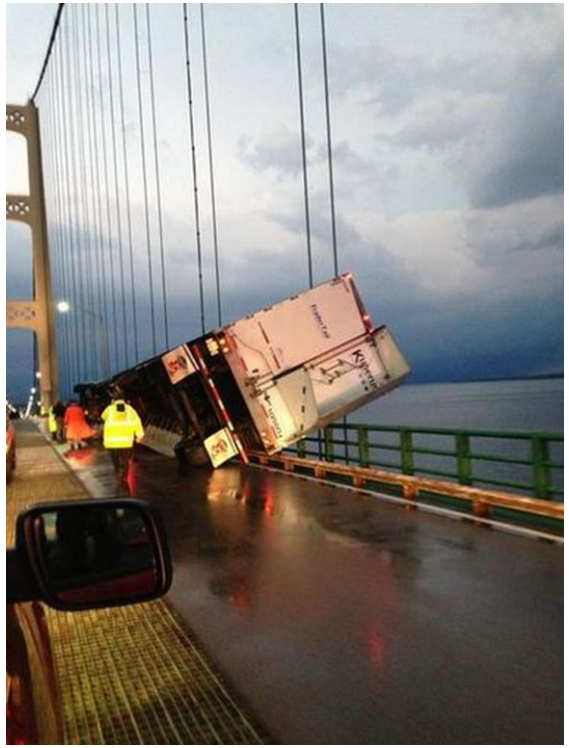
- Sustainability and Weather

What if we knew what the weather was going to do? Super/Hyper-accurate forecasting

Increase efficiency for:



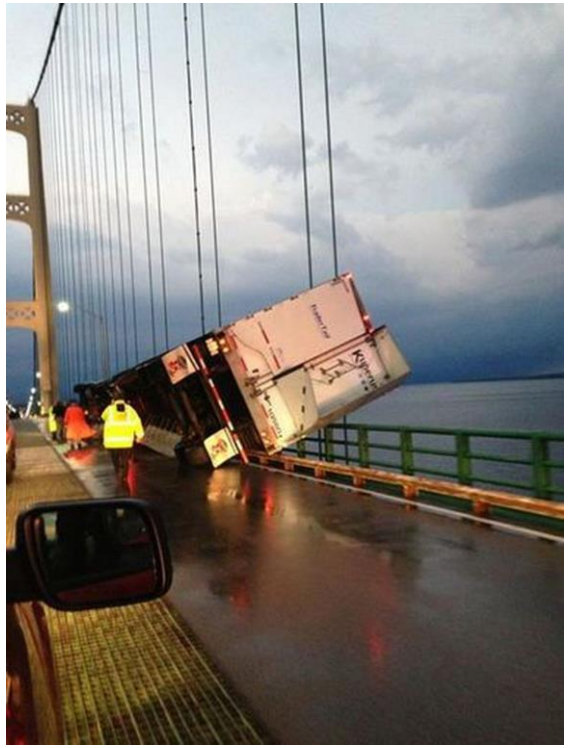
Better planning for better uses of our resources

- Sustainability and Weather

What if we knew what the weather was going to do? Super/Hyper-accurate forecasting

Increase efficiency for:

- *-Tourism*
- *-Education*
- *-Sports*
- *-Construction*
- *-Transportation*
- *-Agriculture*
- *-Industry*
- *-Energy*



Better planning for better uses of our resources

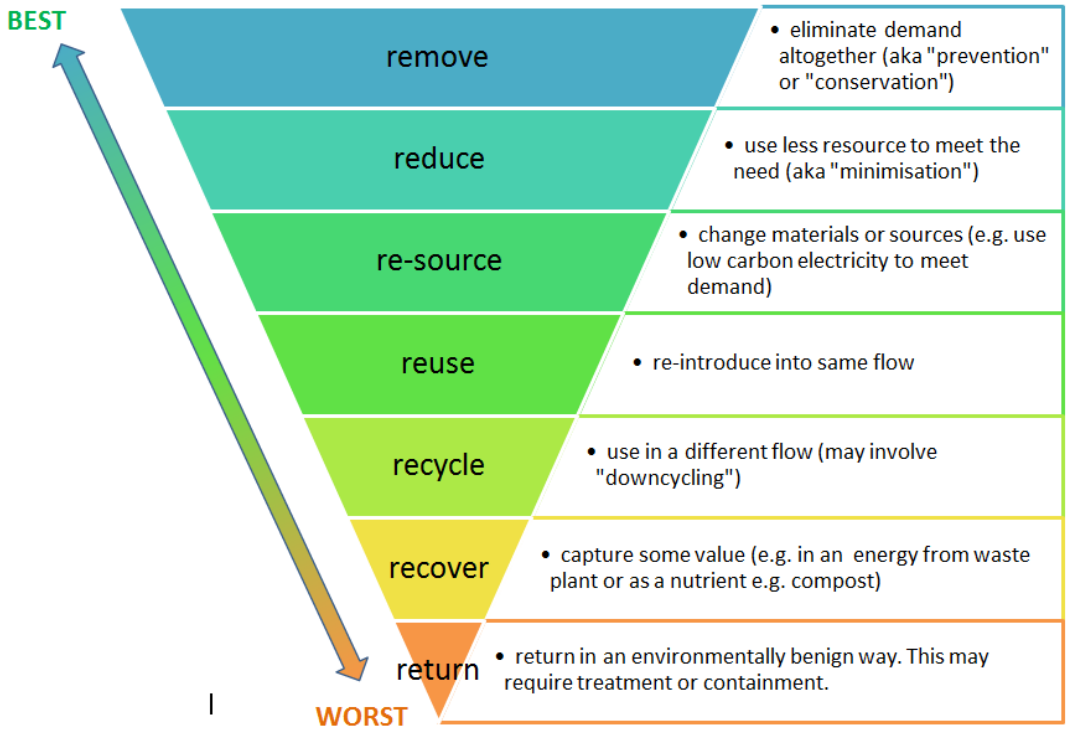
- Sustainability and Weather

INFORMATION IS POWER!

Better Forecast → Better Planning → More Efficient Use of Resources

Less ~~Lies~~ Bad Info → More Efficiency

Works with Weather Information…



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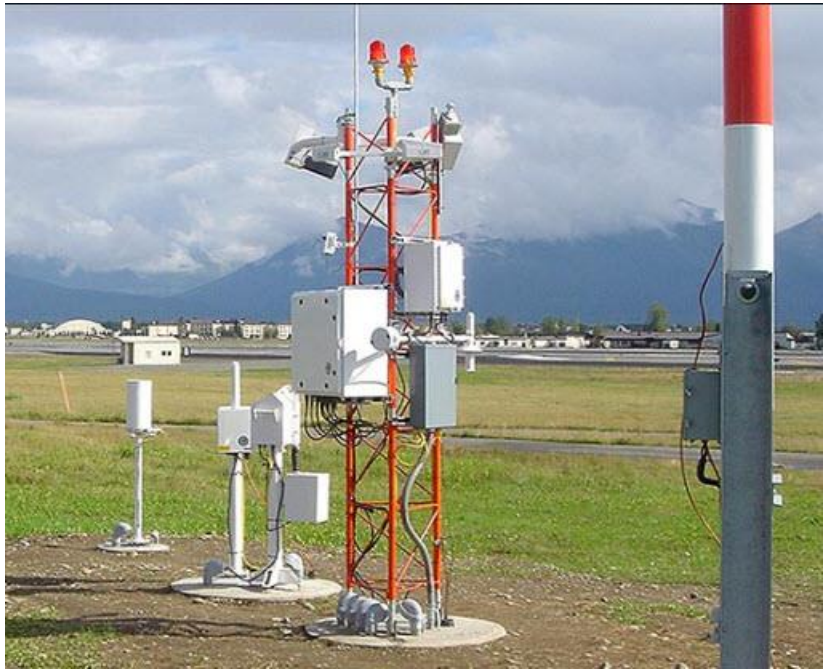
- Sustainability and Weather

Also with MI AWOS network!



FAA ID	ASSOC CITY	FACILITY NAME
AMN	Alma	Gratiot Community
BAX	Bad Axe	Huron County Memorial
SJX	Beaver Island	Beaver Island
ACB	Bellaire	Antrim County
RQB	Big Rapids	Roben-Hood
CAD	Cadillac	Wexford County
CFS	Caro	Tuscola Area
CVX	Charlevoix	Charlevoix Muni
FPK	Charlotte	Fitch H Beach
SLH	Cheboygan	Cheboygan County
OEB	Coldwater	Branch County Memorial
ONZ	Detroit / Grosse Ile	Grosse Ile Muni
DRM	Drummond Island	Drummond Island
FKS	Frankfort	Frankfort Dow Memorial Field
FFX	Fremont	Fremont Municipal
MGN	Harbor Springs	Harbor Springs
JYM	Hillsdale	Hillsdale Muni
OZW	Howell	Livingston County-Spencer J. Hardy
Y70	Ionia	Ionia County
DUH	Lambertville	Toledo Suburban
D95	Lapeer	DuPont-Lapeer
LDM	Ludington	Mason County
MCD	Mackinac Island	Mackinac Island
ISQ	Manistique	Schoolcraft County
SAW	Marquette	Sawyer Intl
RMY	Marshall	Brooks Field
TEW	Mason	Mason Jewett Field
IKW	Midland	Jack Barstow
TTF	Monroe	Custer
MOP	Mount Pleasant	Mount Pleasant Muni
ERY	Newberry	Luce County
OSC	Oscoda	Oscoda-Wurtsmith
RNP	Owosso	Owosso Community
PHN	Port Huron	St Clair County Intl
PZQ	Rogers City	Presque Isle County
HYX	Saginaw	Saginaw County H. W. Browne
LWA	South Haven	South Haven Area Rgnl
IRS	Sturgis	Kirsch Muni
HAI	Three Rivers	Three Rivers Muni Dr Haines
VLL	Troy	Oakland Troy
Y31	West Branch	West Branch Community

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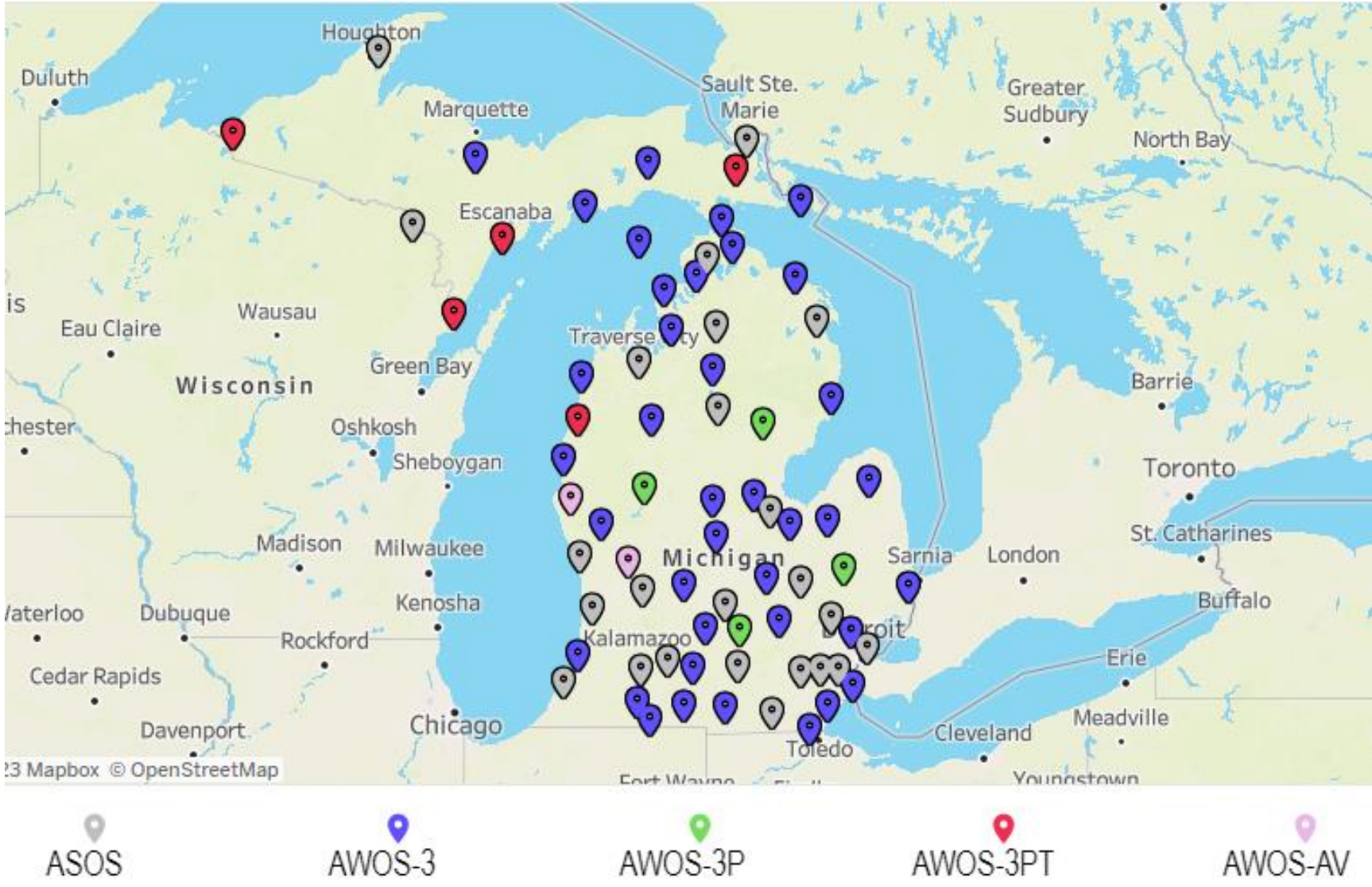
- Sustainability and Weather

But First – History Lesson →

Also with MI ~~AWOS~~ network!
WEATHER



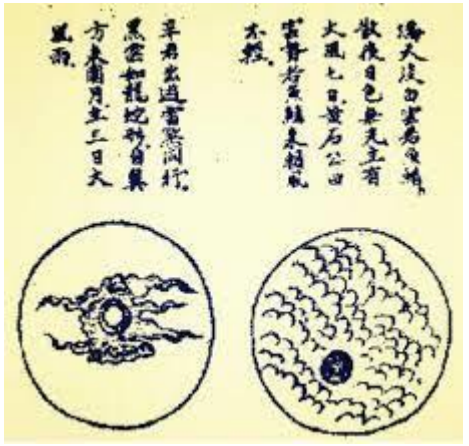
- History of Meteorology

Chinese, Egyptians

Farming, Hunting, etc - ECONOMY

Biblical times – Job 37:22 – "Fair weather cometh out of the North…"

Recorded wind direction, and "mild, mostly sunny"



Babylonians – on record:

Dark Halo surrounding the moon – Expect lots of clouds or rain

Also developed 8 direction wind rose – N, NE, E, SE, S, etc.

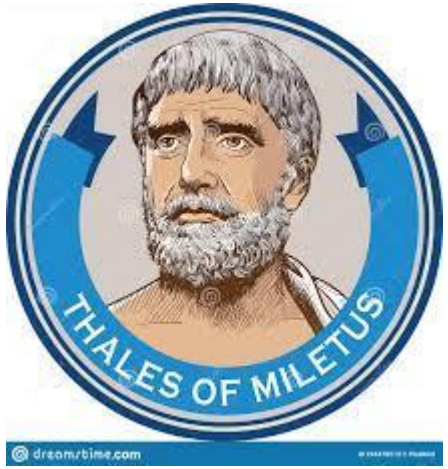
Greeks – Thales of Miletus - ~600BC

First recorded Meteorology

Postulated that everything revolved around water (Water Cycle)

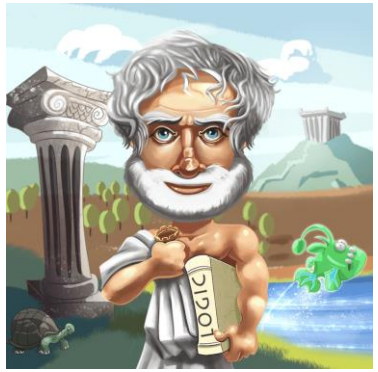
No evidence that he know about clouds being water

Why does Nile flood? → Winds move oceans, mouth of Nile blocked



Greeks – Aristotle - ~350BC

Coined Meteor-logia – study of things high in the air



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- History of Meteorology

What is Meteorology?

Study of long-term and short-term weather and climate patterns, including its effects on the biosphere

Three Branches:

1. Weather and Climate

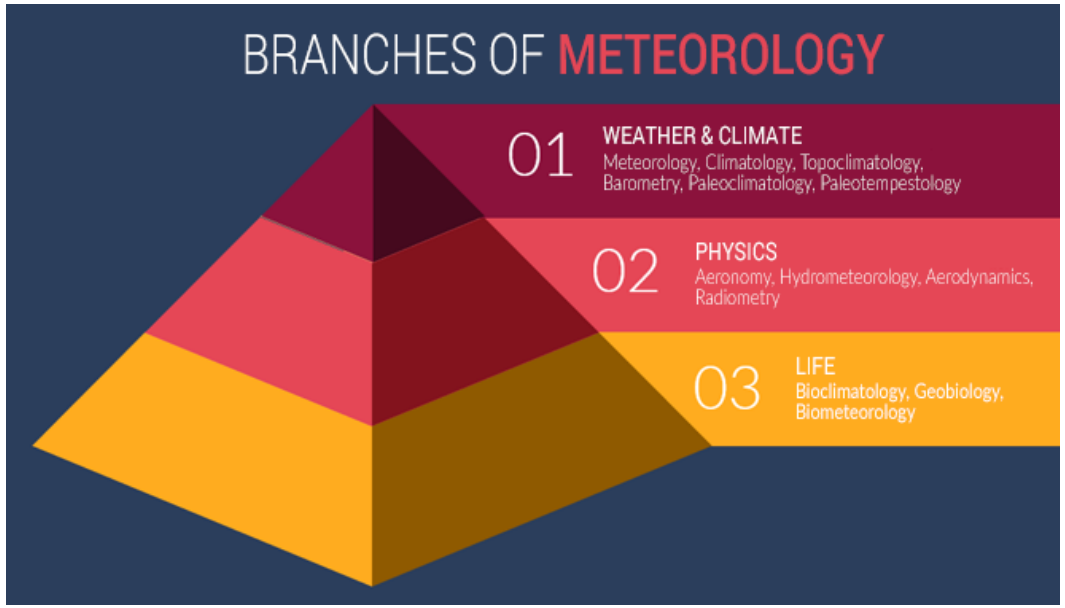
Climatology, Barometry, Topo-climatology, Paleo-

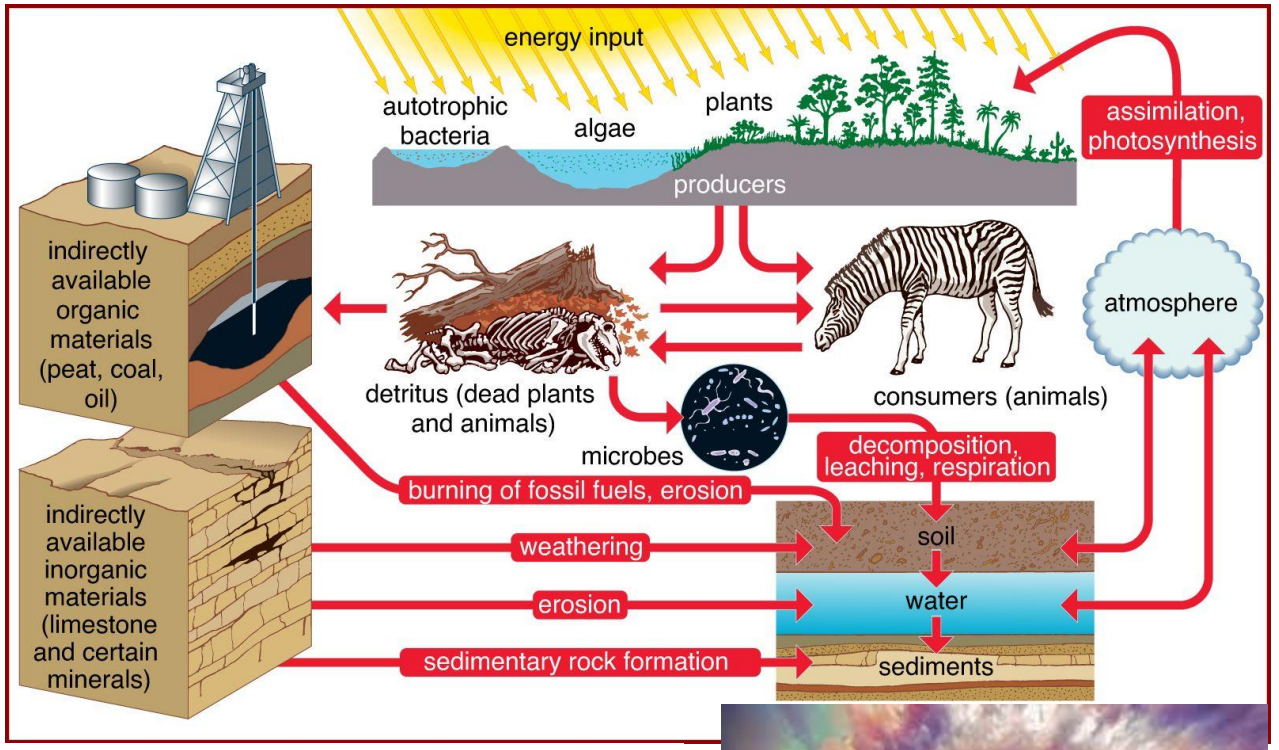
2. Physics

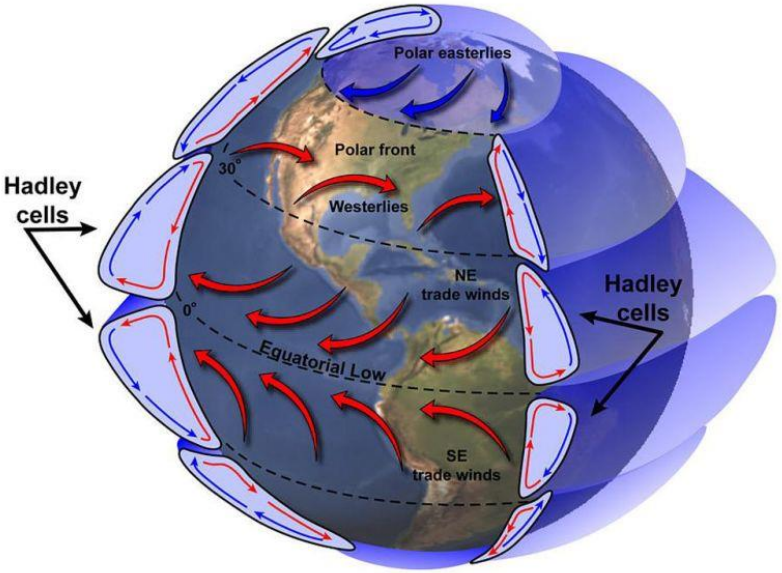
Radiometry, Aerodynamics, Hydrometeorology

3. Life

Bioclimatology, Geobiology, Biometeorology







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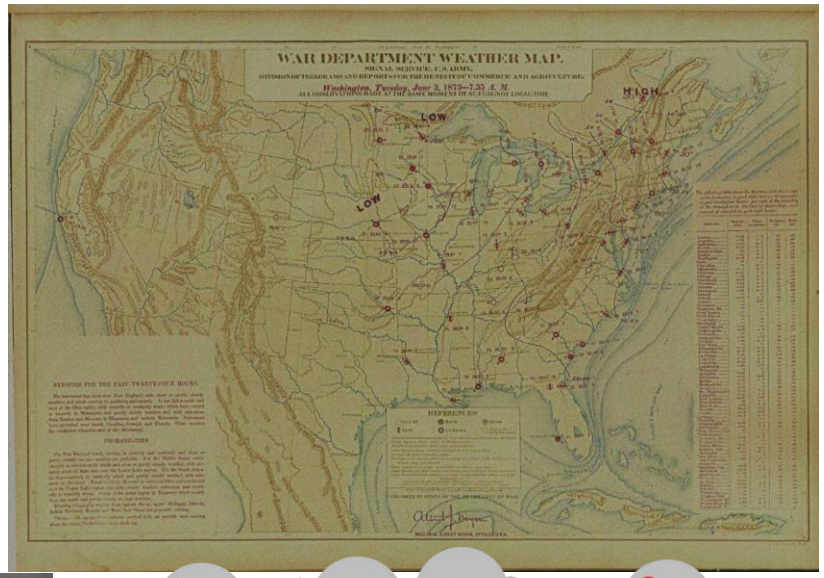
- History of Meteorology

Father of Modern Meteorology – Luke Howard

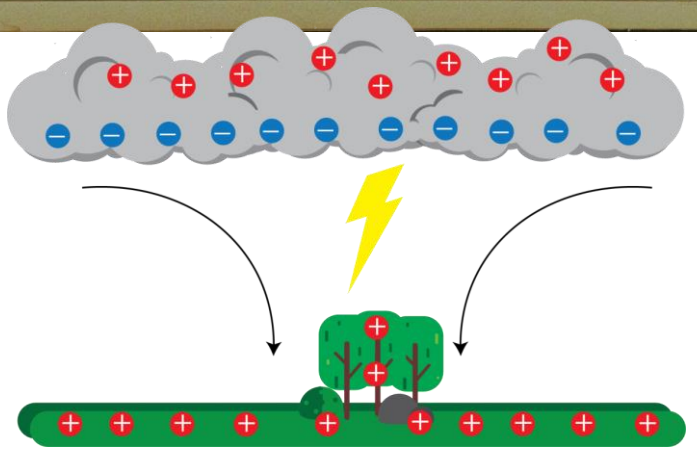
1800's London, Pharmacist and amateur meteorology
Use clouds to tell what's going on with the weather
Electricity in clouds?
Two books –

Climate of London 1818-1820, 1833, 700 pgs of observations and deductions, inc wind, pressure, max temp, and rainfall
Seven Lectures in Meteorology , 1837 first book on meteorology



1850's – Joseph Henry – Smithsonian Director

Gather weather data to Washington DC via telegraph
Help of 150 (grown to 600) volunteer observers
James Coffin/James Espy – first forecasters
Of interest to the US Navy
Civil war…



1869 – Cincinnati Telegraph Service

Collecting weather data from select locations and making weather forecasting charts

- History of Meteorology

Meteorology meets Aviation -

Wright Brothers - Why Kittyhawk?

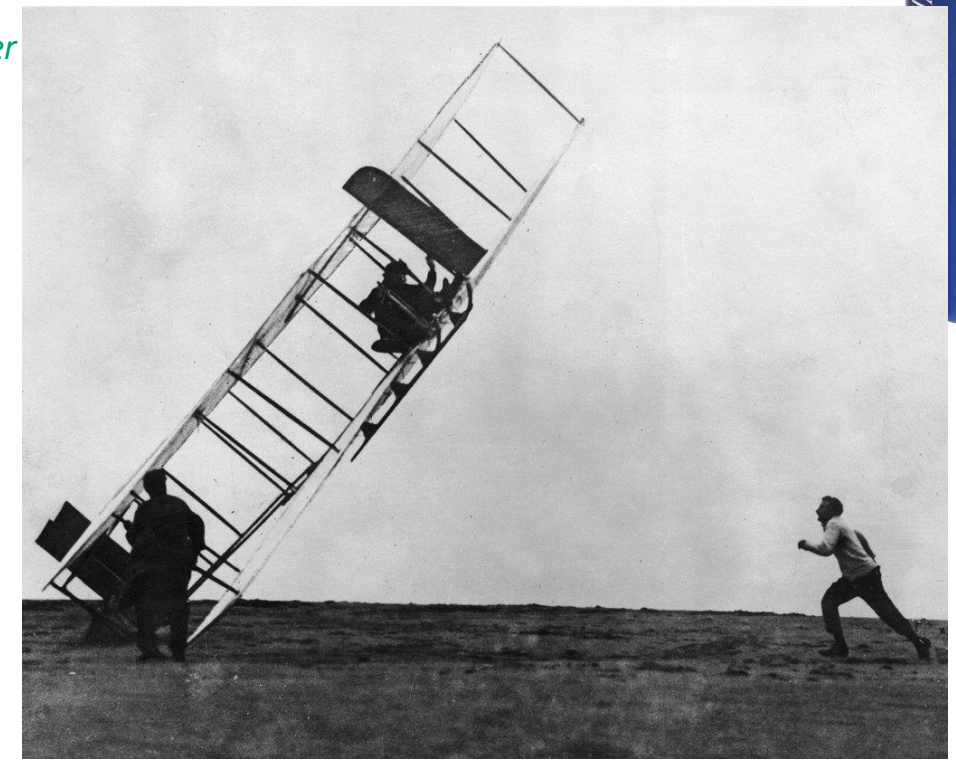
Journals – recorded everything, including weather
Dec.17th – Freezing temps, rain puddles covered by ice, wind gusts up to 27mph

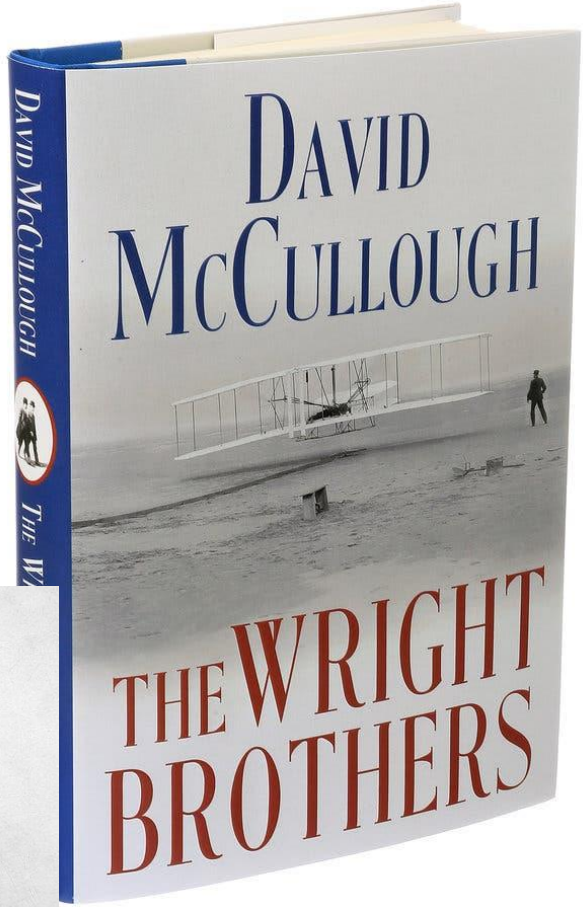
First Aviation Weather Forecast

December 1, 1918, inc. ground observations from NY to Chicago For Aerial Mail Service
Used 18 kites/tethered balloons – 6 from the Weather Bureau and 12 from military installations

First IFR flight – Sept 24, 1929

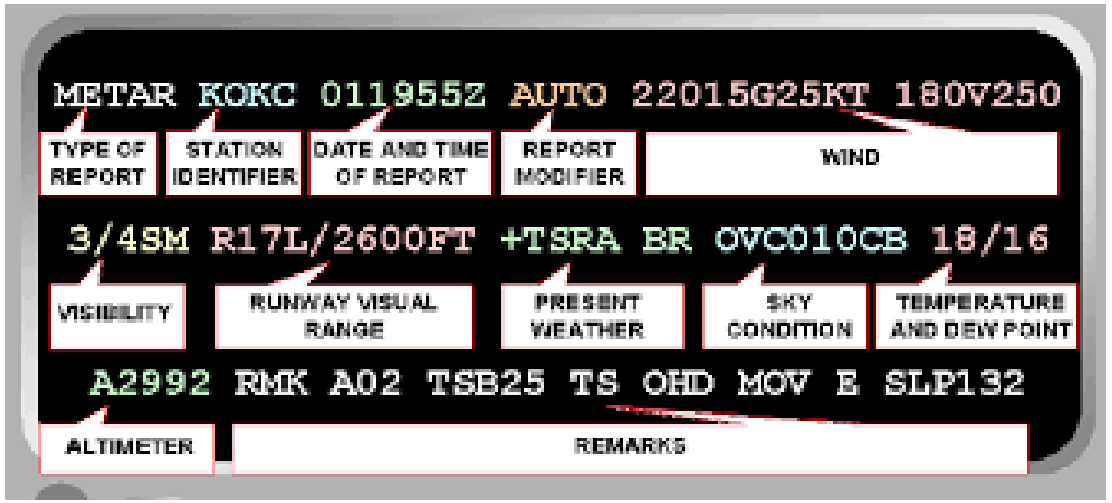
Mitchel Air Force Base – NY
Lt. James Doolittle





- What does the ~~ATIS, AWSS, ASOS,~~ AWOS say??

Service	Name	Owner	Local age	National age
ATIS	***Automatic Terminal Information Service***	***Local Tower***	***1 hour***	***1 hour***
NOTES: Around forever, before automated – Human weather observers recorded an hourly (or earlier as needed) observation				
ASOS	***Automated Surface Observation System***	***NOAA (With FAA/NWS)***	***1 minute***	***1 hour***
NOTES: Not scalable – always have all sensors of AWOS IIIP(?T?), FAA and NWS contracted to maintain and certify system, 1991 deployment				
AWSS	***Automated Weather Sensor System***	***FAA***	***1 minute***	***1 hour***
NOTES: Suppose to be "super ASOS", 1999 – 50 contracted to install, only 17 made it. Can't find one in the system				
AWOS	***Automated Weather Observation System***	***FAA, NON-Fed***	***1 minute***	***1 hr/20 min***
NOTES: Scalable (see next slide)				



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- What does the ~~ATIS, AWSS, ASOS,~~ AWOS say??

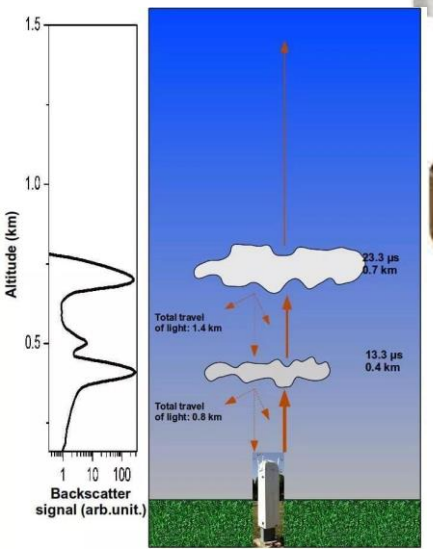
AWOS Types – (scalable)

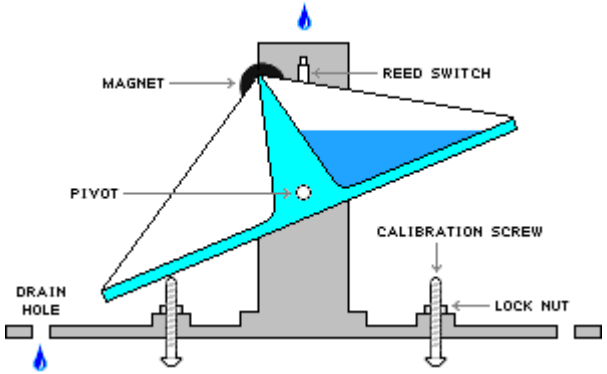
AWOS	*A*	*-Altimeter*
	A/V	*-Altimeter, Visibility*
	I	*-Alt, Wind, T/DP, DA*
	II	*-I + Visibility* *NO NADIN*
	III	*-II + Ceiling, Precip Acc.*
(ASOS type)	*IIIP*	*-III + Precip ID*
(ASOS Type)	*IIIPT*	*-III + Tstorm*
	IV R	*-IIIPT + RW Surface Sensor, and/or*
	IV Z	*-IIIPT + Freezing rain sensor*

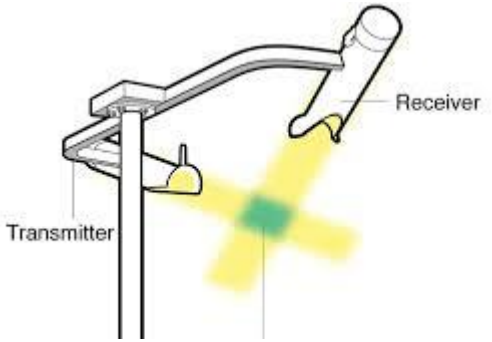
Outputs –

- *Voice Broadcast, 25NM @ 10K ft – 1 Min*
- *Phone line – 1 Min*
- *Via FAA NADIN/WMSCR connection (national) -20 Min*
- *for SOM, Via web- up to the minute data – 1 Min*

NADIN = National Airspace Data Interchange Network
WMSCR = Weather Message Switching Center







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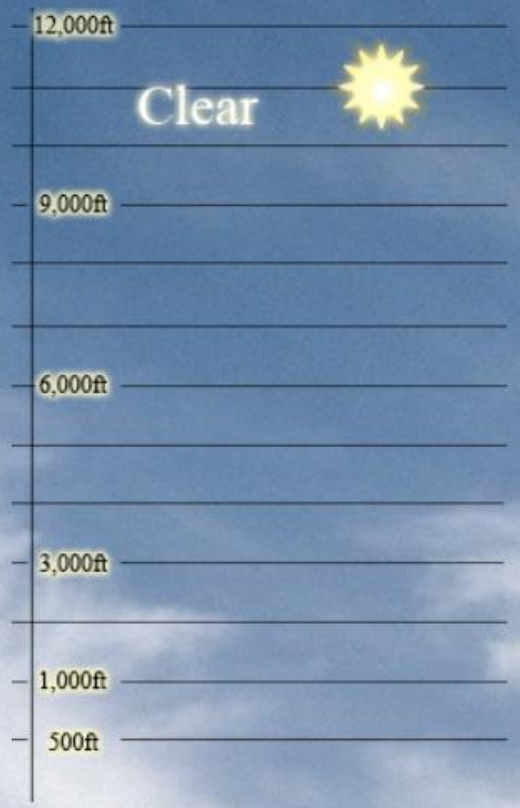
Open Full Screen Window High Contrast Mode

EDT

Weather Information		
Wind Direction	—	
Wind Speed	00 kt (0 mph)	
Wind Gust	00 kt (0 mph)	
Altimeter	30.00 in	
Visibility	10 SM	
Temperature	29° C	84° F
Dewpoint	20° C	68° F
Humidity	58%	
1hr Rain Fall	00.00 in.	
24hr Rain Fall	00.51 in.	

Sky Condition

Clear



METAR KOZW 272026Z AUTO 00000KT 10SM CLR 29/20 A3000 RMK AO2 T02900199

Default

FAA Disclaimer: The data displayed is for advisory purposes only and is not to be used for flight planning or operations.

Source: https://www.anyawos.com/kozw

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Edit

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- Michigan's Non-Fed AWOS

MDOT Aero Electronic Facilities

-Martin Schultz – 70's and 80's

Avionics – (Aviation Electronics) for State Aircraft

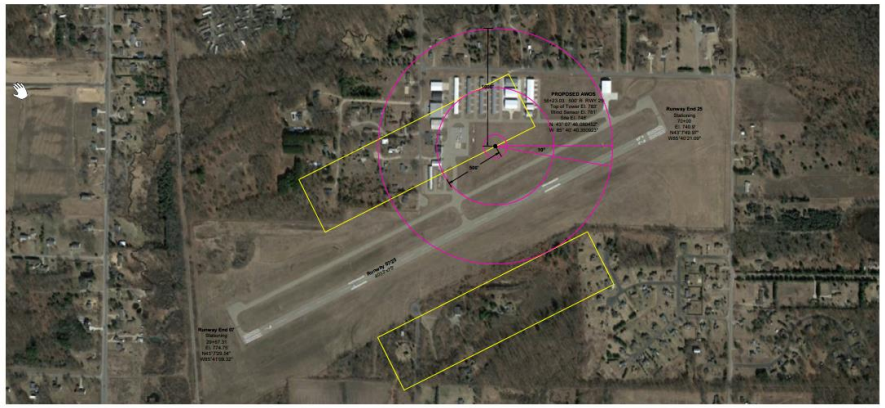
AND

Ground Based NAVAIDS for all aviators
FAA vs. Non-Fed
NDB, VOR, DME, MLS, GCO

AND

AWOS STATION – what a value to aviators at smaller but just as important airports!

1990 – 1st AWOS station in MCD (updated 2010)
90's – some other manufacturers installed (Handar)
1994-2001 – additional 27 stations – State/Local
2004-Present – additional 14 stations – Fed/State/Local
TOTAL – 42 installed (41 still currently operating)
Oldest stations – LDM and MOP – 1999 (useful 15 yrs)



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- Michigan's Non-Fed AWOS

What we do: AWOS

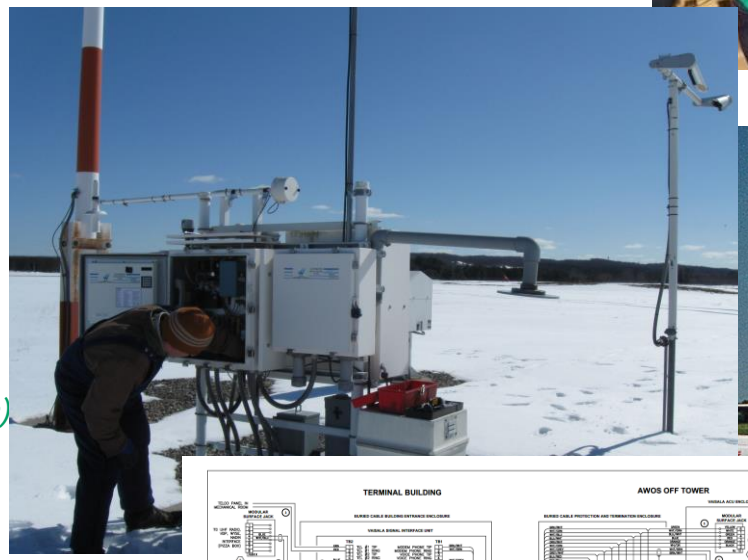
Partner with local airports to collect and distribute safety critical weather information nationally

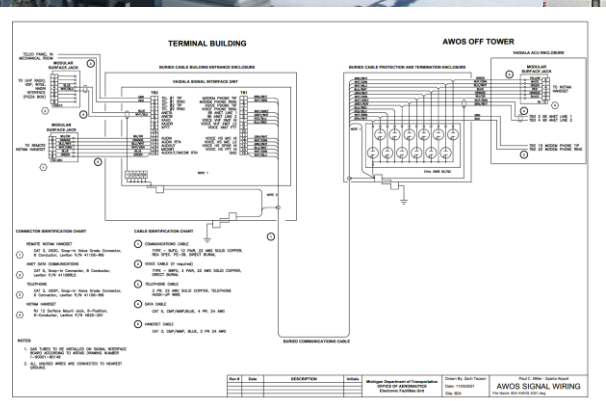
MDOT Part:

1. *Maintain spares and standards*
2. *Conduct in-house repairs and coordinate ext. repairs*
3. *Conduct scheduled maintenance and inspections*
4. *Liaison to FAA and FCC on airport's behalf RE: AWOS*
5. *Repair unscheduled outages, coordinate w/ Leidos*
6. *Coordinate Weather Briefing Services*
7. *Manage weather data collection and dissemination*
8. *Track all costs and invoice appropriately*
9. *Perform "cradle to grave" installation services*

Airport Part:

1. *Select an AWOS III or higher unit*
2. *Provide appropriate space (and obstruction clearance)*
3. *Provide phone/internet connections, power*
4. *Minimal maintenance activities, access to site (weed control, snow removal, "light" cleaning)*





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- Michigan's Non-Fed AWOS

Sustainability: Full Circle

Sustaining Michigan's Non-Fed AWOS Network –

1. *More access to Michigan Airports*
   (MASP - All Weather Access Plan)
2. *Better equipment – longer lasting, more accurate technology*
3. *More data for the NWS – leads to better forecasting*
4. *Better Forecasting → more statewide efficiency for:*

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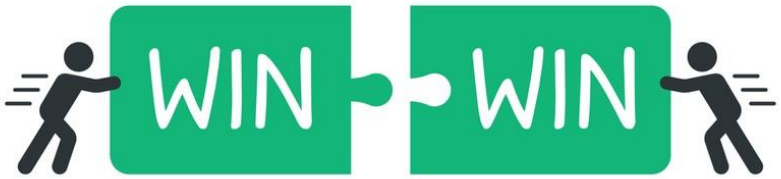
   - *→Agriculture*



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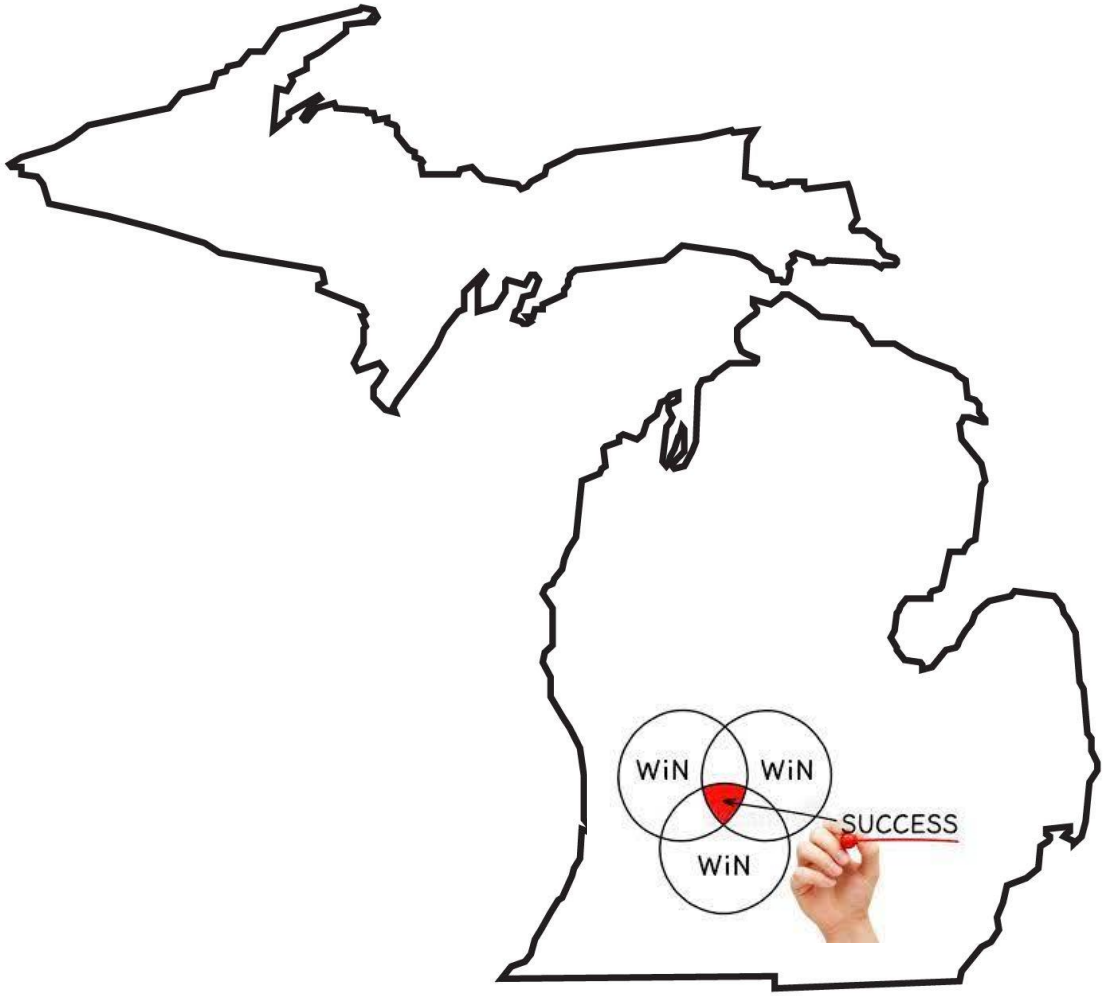
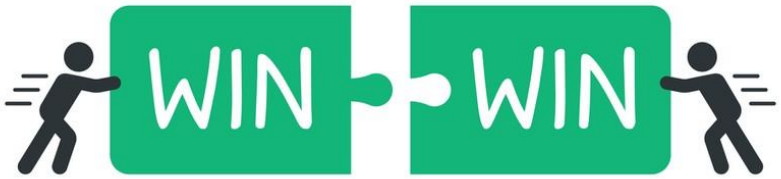
   - *→Transportation*





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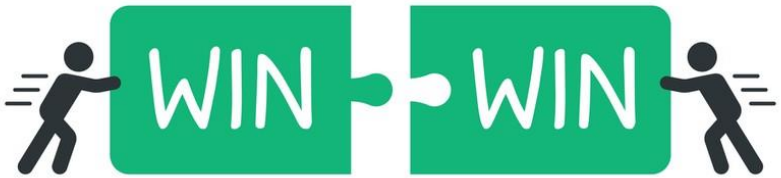

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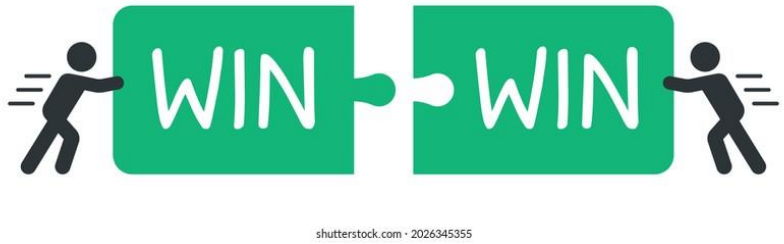
2. *Better equipment – longer lasting, more accurate tech*
3. *More data for the NWS – leads to better forecasting*
4. *Better Forecasting → more statewide efficiency for:*
   - *→Tourism*
   - *→Agriculture*
   - *→Construction*
   - *→Transportation*
   - *→Education*
   - *→Industry*
   - *→Sports*
   - *→Energy*



MDOT Michigan Department of Transportation AERONAUTICS

- AWOS Task Force
-sustaining the network

2019 – What are we gonna do??

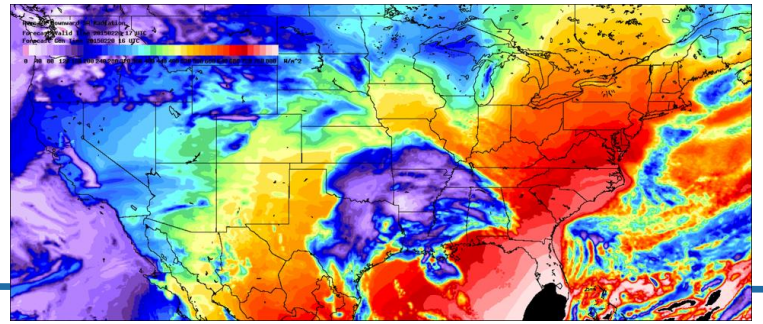
Convened in 2020 – 4 goals

1. *Assess impacts/level of service of the AWOS network*
2. *Examine future AWOS needs*
3. *Make recommendations based on above discoveries*
4. *Advocate for financial/policy support if needed*

Reviewed current system status/challenges
Reviewed needs, BCA for airports/state
Reviewed financial resources

Determinations & Recommendations

1. *Highly valuable – Safety and Economically*
2. *Support MDOT's efforts - in-house AWOS network*
3. *Request of Michigan Legislature $4M to upgrade via a phased approach*



GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
MICHIGAN AERONAUTICS COMMISSION
LANSING

Automated Weather Observation Station (AWOS) Task Force Final Report

Introduction

The Michigan Aeronautics Commission (MAC) and the Michigan Department of Transportation Office of Aeronautics (Aeronautics) is charged with preserving and promoting a safe and efficient statewide aviation system. To support that mission, the MAC has prioritized all weather accessibility across the Michigan Aviation System. With a robust and resilient network of weather stations and weather dissemination equipment, airports across the state can attract and retain airport users during times of

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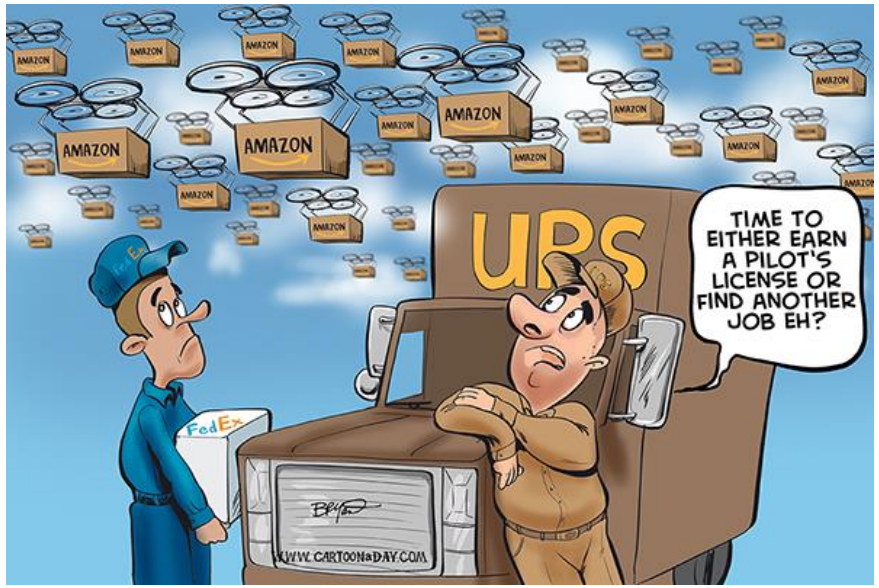
October 2022 (FY23) – Awarded $3.9M for upgrades to AWOS network

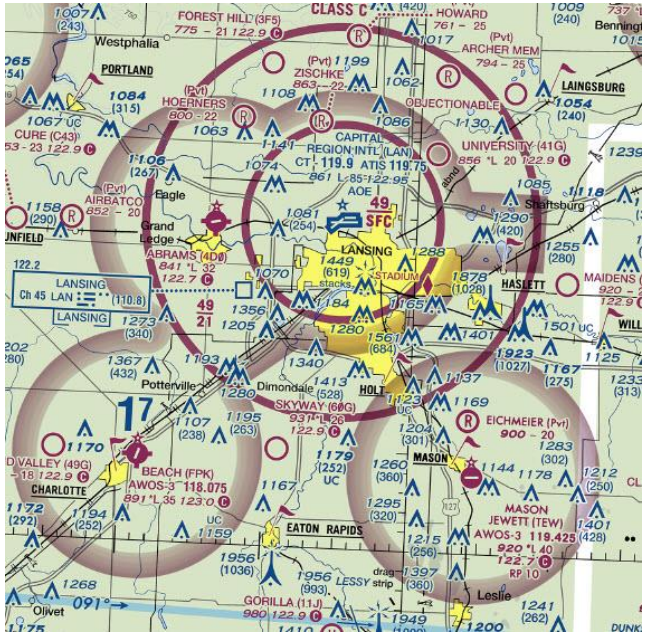
Status –

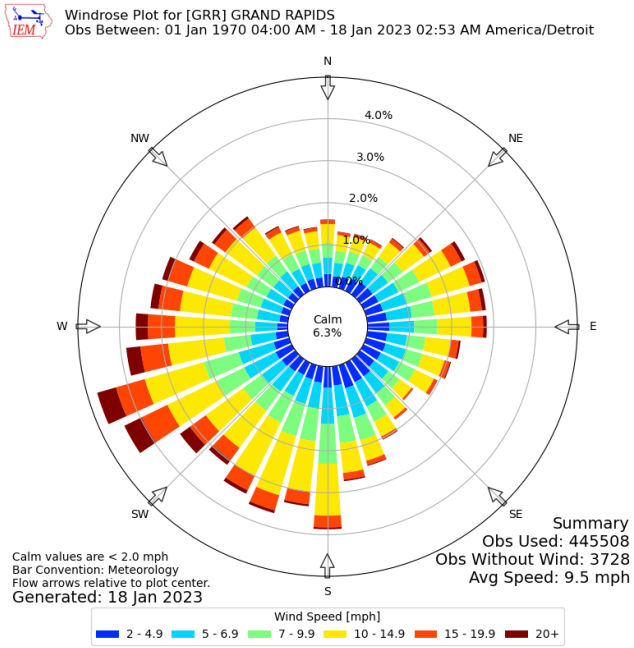
- *Putting together a spec sheet and bid package for bidding to commence - Spring 2023*
- *RFP on the street – Late Spring 2023*
- *Contract award – Summer 2023*
- *Prioritize upgrades across network – Summer 2023*
- *Obstruction analysis/mitigation meetings w/ sponsors - Late Summer/Fall 2023*

- Other Notables

1. *Historical Weather Data*
   - *Iowa State University – Weather Mesonet*
   - *Great Historical Data Archive!*
2. *Weather Cameras*
3. *Thunderstorm Sensors – opt.*
4. *2023 Michigan Sectional Charts*
   - *New feature – Flight Following Boundary/Frequency*
   - *Can you help us??*
5. *FY24 – State/Local*
6. *Picture Call*







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QUESTIONS?

Michael Soper – Electronics Facilities Unit – MDOT AERO
MAAE ~~Winter~~ Fall Conference '23

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