Southeast Alaska

Cloudburst Chronicle

National Weather Service
Juneau, Alaska

Volume 5, Issue 3
December 2005

Eldred Rock Lighthouse was built in 1905 and first lit on June 1, 1906. It was manned with personnel until 1973 when an automatic beacon was installed. The National Weather Service receives temperature, wind speed and direction through a remote sensor on the island.

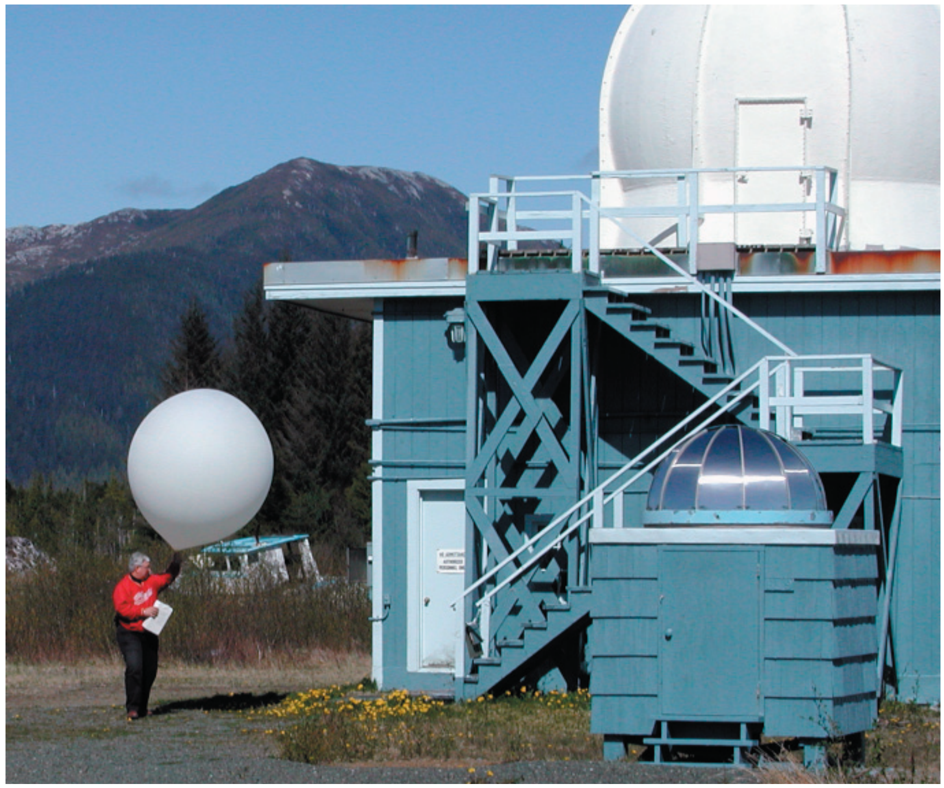
In This Issue:

National Weather Service
8500 Mendenhall Loop Rd
Juneau, Alaska 99801-9218

Telephone: (907) 790-6800

http://pajk.arh.noaa.gov

Editors: ursula.jones@noaa.gov
paul.shannon@noaa.gov
tom.ainsworth@noaa.gov



Balloon release at WSO Annette

Radiosonde Observations

by Bill Blackmore

What is a Radiosonde?

For over 60 years, upper air observations have been made by the National Weather Service (NWS) with radiosondes. The radiosonde is a small, expendable instrument package that is suspended below a 2 meter (6 feet) wide balloon filled with hydrogen or helium. As the radiosonde rises at about 300 meters/minute (about 1,000 feet/minute), sensors on the radiosonde measure profiles of pressure, temperature, and relative humidity. These sensors are linked to a battery powered, 300 milliwatt radio transmitter that sends the sensor measurements to a sensitive ground receiver on a radio frequency ranging from 1668.4 - 1700.0 MHz. By tracking the position of the radiosonde in flight, information on wind speed and direction aloft is also obtained. Observations where winds aloft are also obtained are called “rawinsonde” observations.

The radiosonde flight can last in excess of two hours, and during this time the radiosonde can ascend to over 35 km (about 115,000 feet) and drift more than 200 km (about 125 miles) from the release point. During the flight, the radiosonde is exposed to temperatures as cold as -90°C (-130°F) and an air pressure only few thousandths of what is found on the Earth's surface. When the balloon has expanded beyond its elastic limit and bursts (about 6 m or 20 feet in diameter), a small parachute slows the descent of the radiosonde, minimizing the danger to lives and property.

Only about 20 percent of the approximately 75,000 radiosondes released by the NWS each year are found and returned to the NWS for reconditioning. These rebuilt radiosondes are used again, saving the NWS the cost of a new instrument. If you find a radiosonde, follow the mailing instructions printed on the side of the instrument.

Pilot balloon release, circa 1930. Tracking telescope or "theodolite" used to obtain winds aloft.

Although all the data from the flight are used, data from the surface to the 400 hPa(mb) pressure level (about 7 km or 23,000 feet) are considered minimally acceptable for NWS operations. Thus, a flight may be deemed a failure and a second radiosonde is released if the balloon bursts before reaching the 400 hPa pressure level or if more than 6 minutes of pressure and/or temperature data between the surface and 400 hPa are missing. Worldwide, there are nearly a 900 upper-air observation stations. Most are located in the Northern Hemisphere and all observations are usually taken at the same time each day (00:00 and/or 12:00 UTC), 365 days a year. Observations are made by the NWS at 92 stations - 69 in the conterminous United States, 13 in Alaska, 9 in the Pacific, and 1 in Puerto Rico. There are two National Weather Service offices in Southeast Alaska that release radiosondes. One is WSO Yakutat and the other is WSO Annette. NWS supports the operation of 10 other rawinsonde stations in the Caribbean. Through international agreements data are exchanged between countries.

Early model radiosonde being attached to a balloon. Circa 1936.

How Are Radiosonde Data Used?

Understanding and accurately predicting changes in the atmosphere requires adequate observations of the upper atmosphere. Radiosonde observations are the primary source of upper-air data and will remain so into the foreseeable future.

Radiosonde observations are applied to a broad spectrum of efforts. Data applications include:

- Input for computer-based weather prediction models,
- Local severe storm, aviation, and marine forecasts
- Weather and climate change research
- Input for air pollution models
- Ground truth for satellite data

WELCOME TO THE STAFF!

By Brian Bezenek

In this installment of Forecaster Spotlight, I am proud to introduce our newest staff member, Nathan Foster. Nathan joined WFO Juneau in May, 2005.

Where are you from?
I grew up in Salem, Oregon. I have also spent short amounts of time living in Salt Lake City, Utah and Miami, Florida.

Have you always been interested in weather?
Yes. Ever since I was a kid I have been fascinated by weather. I remember one summer in Salem we had a very rare thunderstorm with lots of lightning. Ever since then I have had an interest in weather. I showed such an interest, my parents bought me a home weather kit for Christmas that same year. Using it, I would diligently take weather measurements. I thought it was the greatest gift.

Where did you get your meteorological training?
I started as a volunteer for the Weather Service in Salem, Oregon when I was 16. I used to go every day after school for three or four hours. I learned everything I could about the National Weather Service including broadcasting on the NOAA Weather Radio, writing forecasts, launching weather balloons, and taking weather observations. I put in 1,500 volunteer hours and was even featured in the local newspaper and television station. I was then hired as a meteorological aide for two years before the Salem office closed. After that I became a paid contractor in charge of launching weather balloons and taking weather observations in Salem. I worked all night shifts for a year while completing my Bachelor's Degree in Geography at Portland State University.

Where else have you worked?
For a year I studied at the University of Utah and I worked as an aide in the Salt Lake City Forecast Office. I also spent the last three years working for the NWS in Cold Bay.

What was it like living and working in such a remote community as Cold Bay?
It was truly a unique experience. The relentless storms were amazing. Launching a weather balloon in 60 mph winds was difficult but exhilarating too. I remember once I had to walk to our weather balloon inflation building about half a mile away in whiteout conditions and 15 foot snow drifts. About half way there I couldn't see any buildings or landmarks to figure out where I was. Eventually I found a building I knew and was able to reorient myself, find the inflation building, and launch the balloon. I'll never forget that.

We had very few sunny days in Cold Bay and the temperature never got above 70 degrees so Juneau seems like Phoenix to me. The town has less than 100 people so you get to know everyone and I will miss that. Although, I won't miss the $20 watermelons and having to order food from a catalog. I also liked working closely with the marine community which relies so much on the marine weather broadcast we did twice daily. It was worth living there knowing how much they appreciated the work we did.

What do you like best about being a forecaster?
The fact that the weather is different each day. I enjoy coming in to work and seeing what's new today. It could be sunny and calm one day and there could be a huge storm the next. I also enjoy interacting with our customers and observers. It gives me a chance to talk about the weather, something I always find enjoyable. I also like learning about Southeast Alaska from our observers since most have lived here many years.

Nathan hard at work.

Why did you choose to accept a job in Alaska?
I really wanted to be a permanent part of the NWS and I enjoy seeing new places. I thought it would be a great way to get my foot in the door and see a place that I have always wanted to visit.

How do you like Alaska so far?
My wife and I love Alaska...even the rain and snow. We have never been to Southeast Alaska so we're really looking forward to getting to know this part of the state. It's a wild and beautiful place and I love the challenge of weather forecasting here.

Thank you very much for your time Nathan, and I hope that you enjoy your stay in Juneau. Tune in next to see whom ends up under the Forecaster Spotlight.

Wild Weather Watchers Receives Awards

By Kimberly Vaughan

The weather, an element in our lives we just can't seem to avoid. It happens no matter what. We know about the people whose job it is to let us know what the weather is going to do. What about how they get their information? Technology has come a long way in the weather community, but there is one tool that has changed little in the last 200 years - volunteer weather observers. These individuals, institutions, and generations of families dutifully collect daily weather data. Even with the technological advances, the information that volunteer observers collect is invaluable for observing and monitoring changes in our environment.

These volunteers understand the importance of weather in their lives and want to do their part in providing usable data for today and establishing historical data for tomorrow. They belong to the Cooperative Observing Program or more affectionately called COOP. There are 33 COOP sites across Southeast Alaska, over 200 in Alaska, and more than 11,000 throughout the United States. Each year, a select few of these volunteers are eligible to receive the John Campanius Holm's award. This is the second most prestigious national award a cooperative observer can receive.

MARY JO IS PRESENTED HER HOLM AWARD BY NWS ALASKA REGIONAL DIRECTOR LAURA FURGIONE

Holm Award recipients are selected on the merits of their outstanding accomplishments and length of service at their site. This year's recipients included one of our own, Mary Jo Lord-Wild of Elfin Cove. Mary Jo received her Holm Award from Alaska Regional Director Laura Furgione during a ceremony on September 27 in Juneau. Mary Jo was also recognized with a length of service award for her 30 years of service to National Weather Service. This was a memorable occasion. Not only did Mary Jo receive her awards but by her side, as he has been for 24 years, her husband Jim Wild received an award for 25 years of service. This duo has been living in Elfin Cove for 34 years and has accomplished many wonderful things: raising three children; fishing; bookkeeping; oyster farming; town speaker for the cruise ships; host of the museum; and much, much more. I had the pleasure of meeting this couple three years ago and knew then they were dedicated and dependable people. Through the next few years I was proven correct and the extent of their true dedication was realized. The most important thing I noticed was that even after all this time they still enjoy "doing" the weather. They tirelessly record the maximum and minimum temperature each day, along with rainfall and snowfall amounts. They ask us questions that only someone really thinking about the how's and why's of weather would ask.

JIM & MARY JO ON THEIR BOAT IN ELFIN COVE

In addition to being Cooperative observers, they are also A-Paid observers. An A-Paid is an aviation weather observer paid for taking several observations a day that include elements required by pilots which include the wind, sky condition, visibility, atmospheric pressure, temperature, and dewpoint. There are 27 A-Paids in the state of Alaska, providing crucial weather information for the aviation community. The two A-Paid observing stations in Southeast also benefit the marine community as well. I am proud and honored to know the Wild's and overwhelmed to see them receive their awards. They are awards well deserved and rightly earned. Thank you, Jim and Mary Jo, from all of us who benefit from your devoted commitment to weather collection.

HISTORY

A Short History of Weather and Technology - Part I

By Paul Shannon

Technology: from the Greek word technologia, techne "craft" + logia "words," or "study". Technology is using "craft" to make peoples lives easier and better. It can refer to the techniques or knowledge used in solving a problem or the tools and machines that help to solve those problems.

Advancements in the science of weather forecasting have always been closely tied to new "technological discoveries", from the first instruments for measuring weather elements (thermometers, barometers, anemometers), to the latest satellite and computer research. So let's start from the beginning and look at some of those many technological discoveries and how they have led us to the current state-of-the-art in weather forecasting.

In The Beginning

Of course, people have been noting, and probably complaining about, their local weather as long as they have been going outside. By 1300 B.C., the Chinese were able to produce weather summaries for a ten year period and by 1000 B.C. they had organized a weather observing network. Ancient attempts at weather forecasting were based on finding patterns in observations of past events. Mainly farmers and hunters, early man was critically dependent on the weather for his existence. Through years of working in the weather they accumulated a local knowledge of weather "signs" that were passed down from generation to generation.

The Greeks, around 700 B.C., had a number of rules for weather prediction, what we now call weather lore. By 650 B.C., the Babylonians were trying to predict short-term weather changes based on clouds patterns, astronomical phenomena, and the behavior of animals. Over the years these were incorporated into well known sayings such as:

Red sky at night, sailors delight!
Red sky in the morning, sailors take warning!

This is one of the oldest and most famous of all weather sayings, being mentioned in some form from the Bible to Shakespeare, and is true more often than not. Weather systems in the middle latitudes usually move from west to east. A red sky at sunset indicates relatively clear skies to the west allowing light from the setting sun to be seen. Hence, sailors can take delight knowing cloud-free weather is on the way. A red sky in the morning indicates few clouds to the east as the sun is rising. This may indicate the clear weather is leaving. If that's the case, sailors should take warning that a new storm is approaching from the west.

Other proverbs arose simply from coincidence, not weather patterns, and therefore seldom work out:

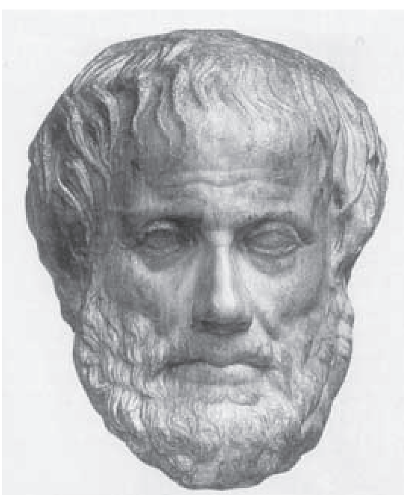
- **"Rain before seven, fine before eleven."**
- **"If cocks crow during a downpour, it will be fine before night."**
- **"The last Sunday in the month indicates the weather of the next month."**

The weather lore that has held up usually deals with very short term forecasts. Attempts at longer range forecasts fair worse. Annual records for Punxsutawney Phil's shadow show that the groundhog prediction is correct half the time and incorrect half the time.

Punxsutawney Phil

Around 350 B.C., the Greek philosopher Aristotle became the first person to record his weather thoughts in a systematic way when he wrote his philosophical treatise, *Meteorologica*. He was also the first person to use the word in writing. The Greek word meteoron refers to things "high in the sky", basically anything between Earth and the stars, while logos means "study". *Meteorologica* contains Aristotle's theories about the formation of rain, clouds, hail, wind, thunder, lightning, and hurricanes. Aristotle's student Theophrastus wrote the more practical study, *The Book of Signs*, which listed more than 200 ways of knowing when to expect rain, wind, fair conditions, and other kinds of weather based on celestial phenomena, without bothering with any explanations.

Typical of Greek science at the time, Aristotle and Theophrastus believed that logic and reason alone could lead to truth. *Meteorologica* and *The Book of Signs* were written by natural philosophers, not natural scientists. They observed the weather, but did not see the need for experiments to confirm or deny their observations.



Aristotle

Still, though almost all of his meteorological conclusions were wrong, Aristotle's book was considered the authority on weather theory for almost 2000 years; it was not until the 17th century that many of his ideas were overthrown.

One of the reasons the Greeks failed to develop an experimental science was due to a lack of technology in the form of precision measuring instruments. For that we must wait for the fall of the Roman Empire, make it through the Dark Ages, and arrive at the beginning of the Renaissance.

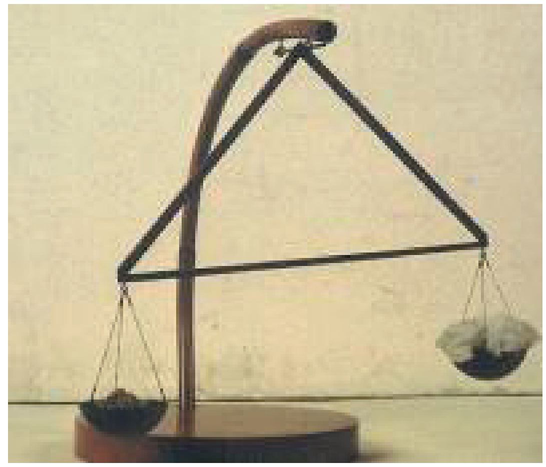
The Renaissance

As we have seen, early attempts to produce forecasts were based on weather lore and personal experience. Finally, by the time of the Renaissance, it became clear that the speculations of the natural philosophers were inadequate. In 1637, René Descartes wrote a series of essays on meteorology called *Les Météores*. It was the first work that tried to give a scientific basis to the study of weather by replacing Aristotle's logic with actual experiments.

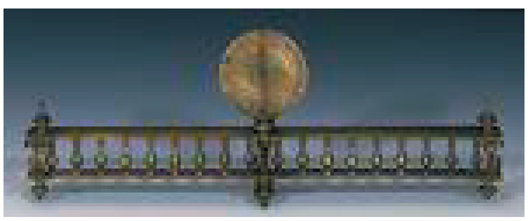
For meteorology to become a genuine natural science though, a way of accurately measuring the properties of the atmosphere was needed. The first three instruments developed to meet that need were: the hygrometer for moisture, the thermometer to measure temperature, and the barometer for pressure.

Hygrometers measure the humidity, or amount of moisture in the air. The Greek philosophers understood the basics of the hydrologic cycle, how water circulated through the earth-atmosphere system, even without instruments. In his *Meteorologica*, Aristotle states:

> **"Now the sun, moving as it does, sets up processes of change and becoming and decay, and by its agency the finest and sweetest water is every day carried up and is dissolved into vapour and rises to the upper region, where it is condensed again by the cold and so returns to the earth."**



da Vinci's Hygrometer

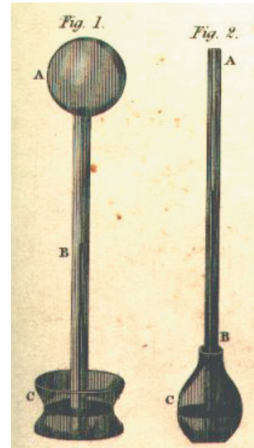


Folli Hygrometer

From the 14th century onward, many instruments were invented for the purpose of measuring that invisible water vapor. The first known design in western civilization was described by Nicholas Cusa in the mid-15th century. Over the next 300 years many inventors from Leonardo da Vinci to Robert Hooke improved on the design using salt, sponges, paper and a grain of oats. These mechanical hygrometers are based on the principle that organic substances contract and expand in response to the relative humidity. The contraction and expansion then moves a needle gage. In 1783, Swiss physicist and geologist Horace Bénédict de Saussure built the first hygrometer using a human hair to measure humidity. This type is still in use today, although they cannot respond to rapid changes in humidity and are temperature dependent. They also need frequent calibration. Other ways of measuring the humidity of the atmosphere were developed over the next 100 years, including condensation hygrometers, which measure the dew point, and psychrometers, which measure the wet-bulb temperature.

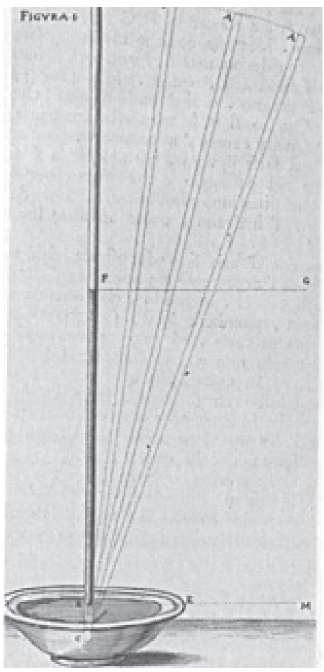
Thermometer: Like many scientific discoveries, the invention of the thermoscope has been attributed to a number of people including Galileo, Santorio Santorio, Robert Fludd, and Cornelius Drebbel. Whichever came first, the addition of graduated scales by Santorio in 1612 transformed the thermoscope into the modern thermometer, which was then capable of measuring the temperature accurately. The first series of quantitative meteorological observations date from this period.

The problem now was that each scientist had his own scale division, which made it impossible to compare temperatures in different places. Many scales were proposed over the years with one disagreement being where the reference points would be. Daniel Gabriel Fahrenheit devised a scale in 1724, so that the melting point of snow was 32 degrees and the temperature "in the mouth or under the armpit of a living man in good health" represented the 96th degree on his scale (which later was changed to 98.6). As unusual as that sounds, the Fahrenheit scale was the first to gain widespread acceptance, mainly due to his perfection of a glassfilled mercury thermometer that allowed him to make a pair of thermometers that both gave the same readings. No one had ever done that before.



Galileo's Thermoscope

In 1732, René-Antoine Ferchault de Réaumur was the first to devise a temperature scale based upon the freezing and boiling points of water. Anders Celsius used those same points to devise his "Celsius scale" with 100 gradations ("centigrade") of temperature in 1742. The original Celsius scale had 100 for freezing and 0 for boiling. The numbers were not reversed until after Celsius's death in 1744. Finally, everyone could agree on just how hot or cold it was.



Torricelli Barometer

Barometer: The barometer is an instrument for "weighing" air and is probably the most significant of the three instruments in the advancement of weather forecasting. It was invented in 1644 by Evangelista Torricelli after moving to Florence, Italy to assist the astronomer Galileo. While experimenting with creating vacuums, he filled a 4 foot long glass tube with mercury and inverted the tube into a dish. Some of the mercury did not escape from the tube because its weight was counter-balanced by the pressure of air on the mercury in the bowl. Thus Torricelli became the first scientist to create a sustained vacuum and at the same time strike another blow to the Aristotelian school which had always held that a vacuum could not exist.

Most importantly for our story, he also discovered that the height of the mercury column varied with changes in the weather. As the weight of the air increased, the mercury in the dish was "pushed" up the glass tube. Conversely, as the weight of the air decreased, the level of the mercury "fell" lower in the tube. This is why a unit of length (i.e. "inches of mercury") is used to indicate the weight of the air. In 1660, Otto van Guericke became the first to use a barometer to forecast weather. When he learned of Torricelli's experiment, he repeated it, made barometric forecasts of the weather based on systematic observations over a period of years, and proposed a network of stations to make reports of the barometer and weather.

Finally, with these and several other instruments in place, the study of weather was ready to take off (literally) into the 18th and 19th centuries and lead us into the real scientific advancements of meteorology and weather forecasting.

STAY TUNED FOR PART II OF WEATHER HISTORY IN THE NEXT ISSUE OF THE CLOUDBURST CHRONICLE FROM PAUL SHANNON!

Cold Weather Pet Care Tips and Safety

By Ursula Jones

The arrival of cold weather brings a lot of things to mind, but sometimes we forget how important it is to monitor our pet's behavior more closely. Pets just are not bred to withstand the cold for any length of time. Huskies, Saint Bernard's, Great Pyrenees', are all breeds adapted to northern climates and generally fair well in colder weather, but most pets do not. Pets, like people, can suffer from frostbite and hypothermia. Be watching for these "trouble signs" with your pet (some of which are the same or similar to human symptoms) while enjoying the cold weather are:

- Shivering or apparent lethargy
- Weak pulse
- Decreased heart rate
- Biting paws or tail
- Feet, ears, or tail unusually cold
- Discoloration of the frozen area
- Lack of pain or sensation at the affected area (i.e. accidentally stepping on their paws doesn't seem to affect them)
- Areas of skin feel cool to the touch

All of these symptoms can mean trouble for your pets. So if you think they are in distress, don't hesitate – take them to the vet! Besides the cold temperatures, we need to be aware of other ways our pets might be injured. If you live near or take your pets for walks near open water that freezes, beware: the ice may not be thick enough to support their weight. If possible, don't let them go near the ice until it is at least several inches thick. By keeping them off the ice, you can prevent them from falling through.

When out in your neighborhood, keep a close eye out for antifreeze that might have spilled. It is an attractant for animals of all kinds because it has a sweet smell and tastes good. The smallest amount of antifreeze can be fatal. Another product frequently used during cold weather is rock salt or ice melt; both can be toxic to your pets. Make sure they have a place to walk outside without walking through any of these products.

Here are a few more tips for winter pet care. 1) If bathing your pet, make sure they are completely dry before letting them outside; 2) never shave your dog down to the skin; a longer coat will provide more warmth; 3) if you are cold, then they are most likely cold; 4) puppies are more sensitive to cold than older dogs, keep a closer watch on them; 5) last, but certainly not least, make sure your pets have enough food and water; frequently checking to ensure outside water bowls remain unfrozen. Just like humans, they are going to burn more calories than normal trying to keep warm while outdoors. Don't let these precautions keep you and your pet from spending time outdoors. You could always break down and buy a coat and booties for your pet to wear outside. With so many to choose from these days, your pet could be stylin' while keepin' warm. Remember – enjoy the cold weather, but do it safely for you and your pet.

NWS Windchill Chart

Temperature (°F)

Wind (mph) \ Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

Wind Chill (°F) = $35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Cloudburst Classroom
by Kimberly Vaughan

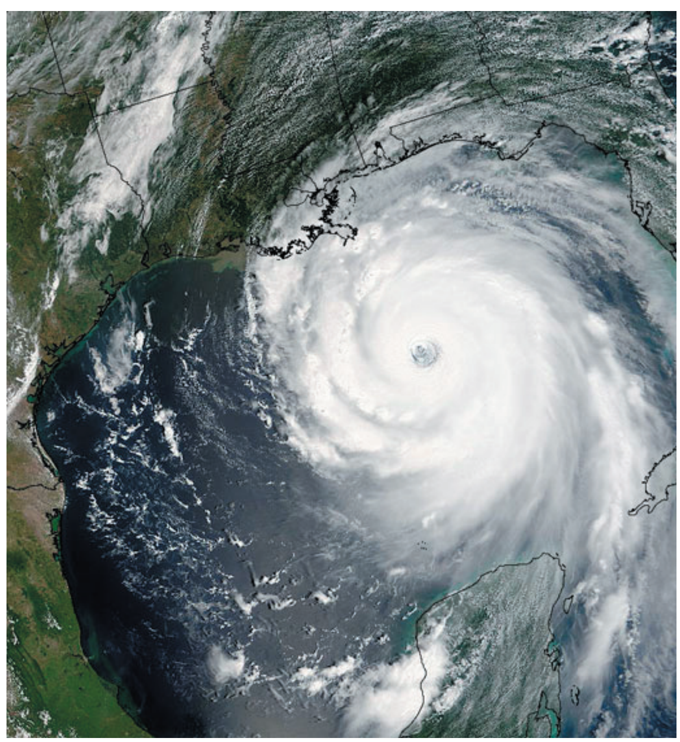
Getting Spun up on Hurricanes

By Kimberly Vaughan

Hurricanes: Why do they form, how do they grow, and what about their names? These storms have been wreaking havoc long before people understood what they were. Hurricanes are not limited to causing damage along coastal areas; some storms can travel hundreds of miles inland producing dangerous conditions in their wake. What you are about to learn about hurricanes might just blow you away.

Hurricanes start out as tropical "waves" of low pressure. The oceans off west coast of Africa, west coast of Mexico, and Indonesia are some favored areas for these storms to develop. On a side note, hurricanes west of the dateline in the Northwest Pacific are called typhoons. These tropical waves are areas of convection, producing heavy rains and thunderstorms. Another ingredient crucial to the formation of hurricanes is very warm sea surface temperature - at least 80^{o}F. We also need a dash of Coriolis force. I will take a moment to explain the Coriolis force. A French scientist in 1835, named Gaspard Coriolis, discovered why weather systems spin. The earth moves faster at the equator and slower at the poles. This change in speed causes winds to "curve" when they move north and south. Maximum wind curvature takes place near the poles and there is essentially zero at the equator. This curvature results in air traveling counterclockwise around low-pressure center and clockwise around high pressure curvature. The faster the air travel around the low pressure center the stronger the low can become. As the tropical wave moves further away from the equator it is acted upon by a stronger Coriolis force and can develop into a tropical depression (TD). A TD is a low-pressure area with winds between 20 and 34 knots.

Another ingredient to the formation of hurricanes is the release of latent heat. When clouds form and rain falls there is a release of heat. This heat feeds the TD, and as with most things, if you feed it – it will grow. As it grows, its cyclonic (counterclockwise) circulation becomes stronger. Once the winds reach 62 knots or higher it is classified as a hurricane. Remember not all TDs become hurricanes, just like not all tropical waves form into TD's. Hurricanes extend so high into the atmosphere that the circulation at the top of the storm actually moves in an anti-cyclonic (clockwise) direction. This acts like a chimney which helps to draw the air up. Upward vertical motion is yet another ingredient that helps to build the storm's strength. As the air rises, water vapor condenses to form clouds. With more condensation the cloud droplets grow and, eventually, fall as rain. Hurricanes grow in strength when they move over warmer water, which is why many storms intensify once they move into the Gulf of Mexico. Generally, if storms move quickly they will tend to lose strength. The strongest section of a hurricane is the forward right quadrant, in relationship to the direction of its movement.



Hurricane Katrina - August 29, 2005

Ok, now we know how tropical storms form, what about how they are identified? Tropical depressions (sustained winds 20-34 knots) are numbered sequentially throughout the season. Tropical depression #5 would be the 5th TD that season. When a TD strengthens to tropical storm force (34-62 knots), it is given a name. In 1953, the National Weather Service (NWS) started using female names to identify TS and hurricanes. In 1979, NWS began alternating between male and female names, except for Q, U, and Z. If the entire alphabet is used during a season, which happened for the first time ever this past season, the NWS continues with the Greek alphabet is called upon to identify the storms. Very notable and/or costly storms have their names retired and replaced with a new name for that letter. "Katrina" will undoubtably be retired in the near future.

Maybe you have noticed that I have been talking about a hurricane “season”. The official Atlantic hurricane season runs from June 1st to November 30th. The Pacific hurricane season starts May 15. Storms have been known to form during the off season, mainly during the months bordering the start and end of the season.

Saffir-Simpson Hurricane Damage-Potential Scale				
Scale Number (Category)	**Central Pressure mb (in.)**	**Winds mi/hr (knots)**	**Storm Surge ft (m.)**	**Damage**
1	>980 (>28.94)	74-95 (64-82)	4-5 (~1.5)	Damage mainly to trees, shrubbery and unanchored mobile homes - Hurricane Lili, 2002
2	965-979 (28.50-28.91)	96-110 (83-95)	6-8 (~2.0-2.5)	Some trees blown down; major damage to exposed mobile homes; some damage to roofs of buildings - Hurricane Frances, 2004
3	945-964 (27.91-28.47)	111-130 (96-113)	9-12 (~2.5-4.0)	Foliage removed from trees; large trees blown down; mobile homes destroyed; some structural damage to small buildings - Hurricanes Jeanne & Ivan, 2004
4	920-944 (27.17-27.88)	131-155 (114-135)	13-18 (~4.0-5.5)	All signs blown down; extensive damage to roofs, windows, and doors; complete destruction of mobile homes; flooding inland as far as 10 km (6 mi); major damage to lower floors of structures near shore - Hurricane Charley, 2004 (winds of 150 mph)
5	<920 (<27.17)	>155 (>135)	>18 (>5.5)	Severe damage to windows and doors; extensive damage to roofs of homes and industrial buildings; small buildings overturned and blown away; major damage to lower floors of all structures less than 4.5 m (15 ft) above sea level within 500 m of shore - Hurricane Andrew, 1992 (26.5 billion dollars in losses) & Hurricane Katrina (170 mph sustained winds), 2005

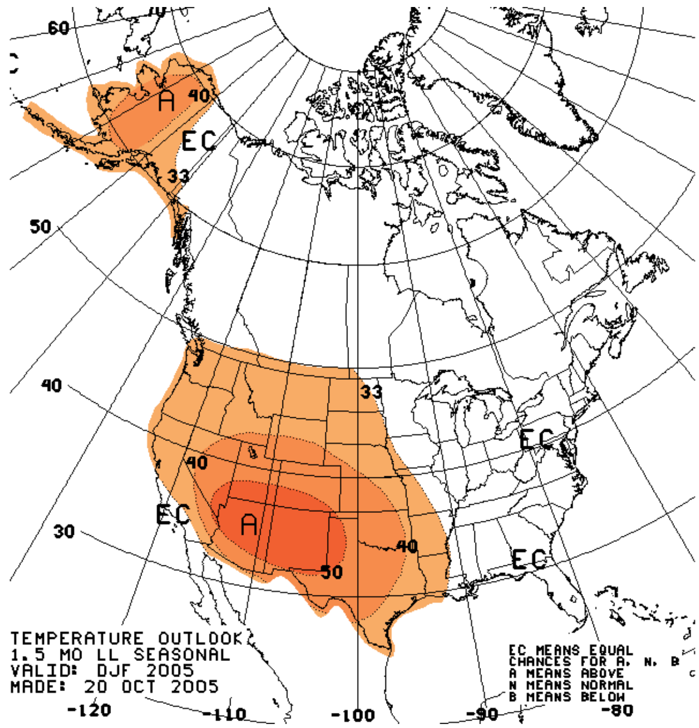
Hurricane intensities are broken into five categories depending on wind speeds using the Saffir-Simpson Hurricane Scale (mentioned in the last issue of *Cloudburst Chronicle*). Researchers have done many studies and have found that at specific wind speeds certain destruction can be expected. This does not take into account any storm surge, rainfall, or flood damage.
We have mostly talked about hurricanes and how they relate to wind, but there are other factors that make these storms dangerous. Most damage from a hurricane near coastal areas is caused by storm surge. The low pressure associated with the storms allows the sea level to rise several feet. When coupled with a high astronomical tide and high wind, storm surge can become monstrous. Storm surge becomes dangerous when large debris is present in the wave action. Hurricanes produce heavy rainfalls with amounts measured in inches per hour. This rapid accumulation of rain causes standing water and swollen rivers that may spill over their banks. Flooding along roadways becomes dangerous as roads and bridges may be washed away. Thunderstorms that can produce hail may also be present. Lastly, hurricanes may also spawn tornadoes which cause their own havoc.

Let’s review. Hurricanes form from organized convection over very warm water. Their sequence of development is categorized as a tropical depression (given a number), then a tropical storm (given a name), and then a hurricane. Hurricanes demand our respect because of the power they possess and the destruction they can cause. To stay safe while in hurricane country, stay informed and always heed the official warnings.

Seasonal Climate Forecasting and Our Winter Outlook

By WFO Juneau Climate Team

NOAA's Climate Prediction Center issued their winter outlook for the U.S. in mid-October. For much of the Alaska Panhandle the Climate Prediction Center is calling for an equal chance of above normal, below normal, and near normal temperatures and precipitation.



On the surface, this outlook appears to have the skill of a coin flip. But "equal chances" does not mean "your guess is as good as mine". Let's look a little deeper into seasonal outlooks and use that understanding to interpret the winter outlook for SE Alaska.

First, let's define the term normal. The American Meteorological Society's Glossary of Meteorology defines "normal" as:

The average value of a meteorological element for any fixed period of years. Recommended international usage is to recalculate normals at the end of every decade using the preceding 30 years. This practice is used to take account of the slow changes in climate and to add more recently established stations to the network with observed normals. [Note: The current 30-year reference period is 1971-2000.]

Unfortunately, in the weather business, normal is often misinterpreted as meaning the weather that one should expect for a given time of year. More accurately, normal refers to the statistical mean or median value. The Seasonal Outlook, therefore, describes the probability that temperatures and precipitation will deviate from normal for the next one- and three-month periods.

Now let's consider how seasonal outlooks are made. NOAA climate outlooks are both statistically and physically based. That means a blend of numerical prediction models (statistics) and ambient ocean and atmospheric conditions (dynamics) are used in making the prognosis. The statistical inputs to climate prediction are extremely complex. Scientists rely on dynamic numerical models, linear regression, predicted pattern evolutions, persistence, and even soil moisture.

The physical inputs to seasonal climate prediction might be easier to visualize. The main physical "climate signals" that influence our seasonal outlooks encompass different time scales and include:

1) Growth and decay of tropical precipitation patterns over the western Pacific and Indian Oceans. These have a significant effect on seasonal heavy precipitation patterns along the west coast of North America including Southeast Alaska. The Madden-Julian Oscillation (MJO) is an intra-seasonal (30-60 day) phenomenon related to tropical rainfall patterns used in making seasonal outlooks. The strongest impacts of intra-seasonal variability in the U.S. occur during the winter months over the western U.S.

2) The warming and cooling of the equatorial Pacific sea surface temperatures (SST). These variations can influence the location of the jet stream and storm tracks over North America. El Niño and La Niña are inter-annual (3-8 years) cycles of SST. El Niño refers to warmer than normal SST and La Niña cooler than normal SST. Intra-seasonal oscillations often exhibit a strong relationship to the phase of the ENSO (El Niño and the Southern Oscillation) cycle. Overall, there tends to be weak or absent MJO activity during moderate or strong El Niño episodes. In contrast, MJO activity is often substantial during ENSO-neutral years and during weak La Niña episodes. So far, this is holding true this winter.

3) Comparing the most recent 10 or 15 year mean of temperature and precipitation for a given location and time of year with the entire 30-year climatology period. This is an inter-decadal scale.

There is a strong correlation between warmer than normal winters and below average snowfall (and vice versa) in the Panhandle. This is primarily because arctic air must move down into our Inner Channels from the Interior to change our typical rain over to snow. During these arctic outbreaks, a boundary is formed with the moist, temperate ocean air mass we typically experience. Usually just north of this arctic boundary is where very heavy snowfall occurs with a given winter storm. The greater the frequency of these arctic outbreaks in a given year, the greater the frequency of heavy snowstorms. This type of weather was more common in the 1960s and early 1970s. More recently, warming in the Arctic and Interior has resulted in less frequent and weaker cold air outbreaks, and milder winters in Southeast Alaska.

After analyzing the statistical and physical components used in climate prediction, and diagnosing the trends, NOAA's Climate Prediction Center issues the seasonal outlooks in terms of "probability anomaly". The forecast probability anomaly is the difference between the actual forecast probability of the verifying observation falling in a given category (above normal, below normal, near normal) and its climatological value of 33.3%.

The seasonal outlook for Southeast Alaska ("equal chances" of having above, below or near normal temperatures and precipitation this winter) results from the lack of any strong physical and statistical indicators. Does the absence of indicators pointing to either above normal or below normal mean temperatures and precipitation amounts will end up near the 30-year climatological averages? Not necessarily. It means the probability for having a colder than average winter is just as likely as having a warmer than average winter and just as likely as a winter with near average temperatures. Is there any information to help tip the scales in one direction? Let's look at the observable physical parameters.

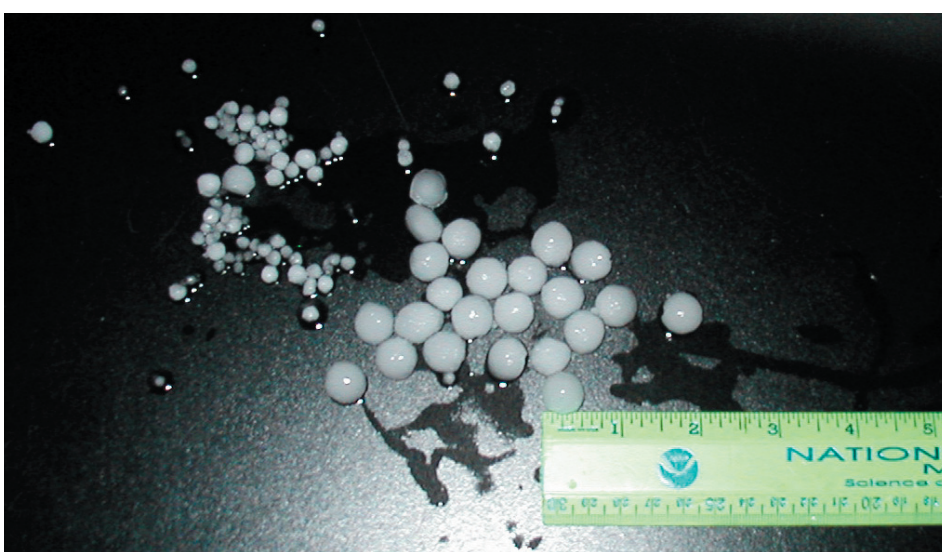
This fall, the MJO has been "positive" which means abundant storm activity in the western Pacific around Indonesia. Storms originating in those waters would have a tendency to move northeast across the Pacific and up into the Gulf of Alaska. The warm, heavy rains Southeast Alaska experienced in November were caused by storms moving out of the active tropical west Pacific in a pattern nicknamed "The Pineapple Express".

This winter will be ENSO Neutral, meaning that sea surface temperatures along the equatorial Pacific will be near normal. This ENSO Neutral condition has proven to have little influence on the jet stream and storm tracks over North America, hence the lack of a climate signal, and equal chance prediction from NOAA's Climate Prediction Center.

The Climate Services Team at the NOAA's NWS Forecast Office in Juneau examined local antecedent conditions. We analyzed temperatures and precipitation totals of this fall, identified other autumns having similar figures, and looked at what kind of winters followed in those years. The results of that study pointed to having a somewhat warmer than average winter in Southeast Alaska. In our maritime (ocean modified) climate there is a correlation between winter temperatures and seasonal snowfall totals. With fewer episodes of arctic cold air in the interior making it as far south as Southeast Alaska, the likelihood of having much above average snowfall diminishes.

Climate prediction is a complex and highly variable enterprise. Unlike day to day forecasts issued by the NWS, climate prediction is not "deterministic" but rather entirely "probabilistic". NOAA looks for strong dynamic and statistical signals for guidance in predicting whether the sensible elements of temperatures and precipitation will be above or below normal for a particular season. Currently, those global scale signals are in a state of flux and essentially having no influence on the probabilistic seasonal outlooks. We can expect a variety of weather this, and every winter, including cold spells, periods of snow, rain and wind. But in the big picture of climate prediction, there are no indications this winter will be much different from the trend over recent winters: temperatures over the December-February period will average out to be at or above normal and snowfall totals will end up being less than the 30-year average.

For more information on climate prediction, MJO, El Niño and La Niña, please visit NOAA's Climate Prediction web page at: http://www.cpc.ncep.noaa.gov/. For information on climate data, try the Climatology link on the Juneau Forecast Office web page: http://pajk.arh.noaa.gov/clim.php.



One-half inch hail occurred during a nocturnal thunderstorm at Annette Island on November 11th. Thunderstorms are not uncommon in the fall in Southeast Alaska, but hailstones this size are. Hailstones 3/4 of an inch or larger are considered severe weather.

COOP CORNER

By Kimberly Vaughan

I would like to introduce our three newest COOP observers. Last year, Hoonah lost the COOP observer of many years because he moved, leaving a gap in Hoonah's weather collection. Earl and Ron, of the City Water and Sewer Treatment Plant, stepped up to the challenge and have been completing daily records of the weather since April 2005. The new COOP site was close enough to the old site that we were able to just relocate it. When COOP sites are moved all the data from the past COOP station is considered to be from a different site, but having the new COOP site relocated, allows the new data to be joined with all the past data for the Hoonah COOP station. Originally commissioned in 1972, the Hoonah COOP has accumulated over 30 years of data.

Hoonah Harbor

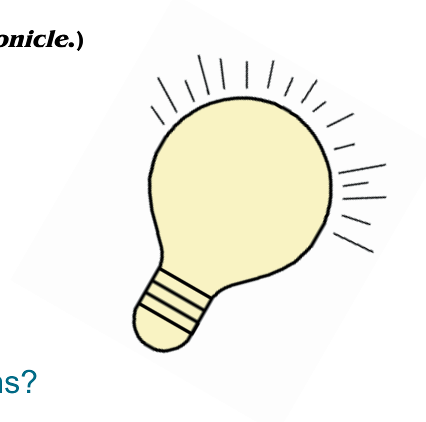
Another new COOP located at Meyers Chuck, which is a small community located 36 miles north of Ketchikan, has an individual who wears many hats and she was eager to wear yet another. Cassy who is a 44 year resident Meyers Chuck joined our family of COOP Observers in July 2005. She has also been able to recruit a back up Observer, Rebecca, when she has needed to step away from her post. Meyers Chuck has an average winter population of six with as few as one...anyone want to guess who that one brave soul is?! Thank you and keep up the great work!

Cassy of Meyers Chuck

For COOP's and anyone else interested, be sure to sign up for a free email subscription list to a COOP newsletter at http://www.weather.gov/os/coop/coopnews_list.shtml.

Cloudburst Trivia

(Answers to the following are contained in this edition of *Cloudburst Chronicle.*)



1. What is the windchill if the wind is 20 miles per hour at a temperature of -5°F? a. 9°F b. -9°F c. -19°F d. -29°F
2. What kind of winds did Hurricane Charley attain in 2004? a. 170 mph b. 150 mph c. 130 mph d. 110 mph
3. How many COOP sites are there in Southeast Alaska? a. 11 b. 22 c. 33 d. 44
4. Some pets cold weather distress symptoms similar to humans? True or False
5. Where did Nathan Foster live for three years before moving to Juneau? a. Cold Bay b. Anchorage c. Kenai d. Fairbanks

WEATHER WATCHERS

SOUTHEAST ALASKA SPOTTER NETWORK

Our Most Valuable Spotters

Since the last *Cloudburst* we have had almost every type of weather, except sunshine, of course! With so many spotters calling in, it was difficult to select the Most Valuable Spotter for this newsletter, but thanks to ***Ken Skaggs*** located on Shelter Island and ***Paul Swift*** of Haines, we were able to keep up with the torrential downpours, poor visibility, and high winds. Many thanks goes to all the Weather Spotters in Southeast Alaska for calling in reports about heavy rain and snow, mud slides, flooding, thunder and lightning, high winds and hail along with downed trees. You've gotta love our diverse weather. Each and every report we receive is invaluable, so keep calling in those reports. Paul and Ken will be receiving a 2006 Alaska Weather Calendar! Keep of the good work and congratulations on a job well-done.

The photo taken of the Mendenhall Glacier, located in Juneau, was taken on an overcast day. Juneau has an annual average of only 44 clear days, 41 partly cloudy days, and a whopping 280 cloudy days. That brings the annual average of cloudy days in Juneau to 76%! I don't know about you, but these facts make me want to really enjoy those 44 days of clear weather as much as I can.

WRITING FOR THE READER

- Questions about weather you want answered
- Suggestions for improving this newsletter

Send your questions & suggestions to ursula.jones@noaa.gov

Don't forget to send photos you want to share.

Trivia Answers: ***1.*** *D.* -29°F (page 8 shows the NWS Windchill chart, keep it handy on those cold and windy days.) ***2.*** B. 150 mph (page 12 has a chart showing the different hurricane categories. 2005 Hurricane Rita made the Category 5 list.) ***3.*** C. 33 COOP's in Southeast Alaska and more than 11,000 throughout the United States. (see page 2 for the rest of the story.) ***4.*** True. (Always keep a close eye on your pets, watching for the same signs a human displays when enjoying Southeasts inclement weather. -- page 8 for has more pet care information.) ***5.*** D. over 60 years! -- page 13 has the full story on radiosondes. ***6.*** A. Cold Bay, located on the Alaska Peninsula is has less than 100 people (page 3 has Nathan's introduction.)

This quarterly educational newsletter is designed for Southeast Alaska's volunteer weather spotters, schools, emergency manager, and the news media. All of our customers and partners are welcome to subscribe to it.

NOAA's National Weather Service Forecast Office in Juneau, Alaska is responsible for weather forecasts and warnings from Cape Suckling to the Dixon Entrance.

This publication, as well as all of our forecasts and warnings, are available on our web site: http://pajk.arh.noaa.gov. Our newsletter is available in color on our site.

Comments and questions regarding this publication should be directed to Ursula Jones at (907) 790-6802 or e-mail: ursula.jones@noaa.gov.

Contributing authors in this issue include:

Bill Blackmore, -
Meteorologist, Observing Systems Branch, NWS HQ

Brian Bezenek -
Lead Forecaster

Kimberly Vaughan -
Observing Program Leader

Paul Shannon -
Information Technology Officer

Ursula Jones -
Administrative Support Assistant

WFO Juneau Climate Team -
Brian Tassia
Tom Ainsworth
Carl Dierking
Chris Maier
Kimberly Vaughan
Michael Mitchell
Ursula Jones

NOAA's National Weather Service
WFO Juneau
8500 Mendenhall Loop Road
Juneau, Alaska 99801-9218

PRST STD
US POSTAGE PD
JUNEAU AK
PERMIT NO G-19