

Living with Climate Change: An Undergraduate Course for Western Alaska

Abstract

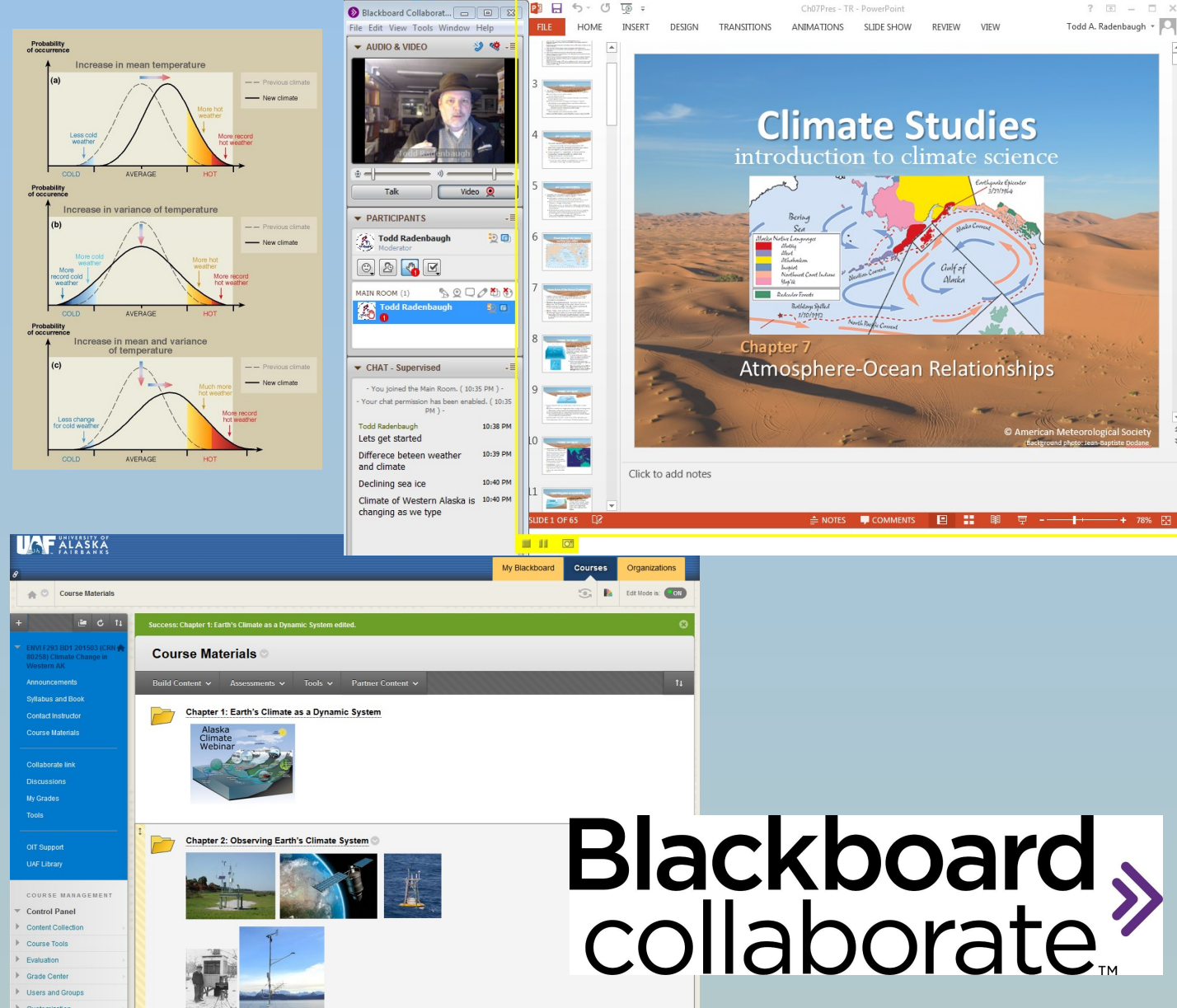
Todd A. Radenbaugh, University of Alaska Fairbanks Bristol Bay Campus, Dillingham, AK

Over the past decades the remote communities in Western Alaska have increasingly been influenced by weather variability and extreme geographic events attributed to climate change. Because of this, most Alaskans have come to accept the fact that the climate is changing. Nonetheless, many Alaskans desire to know more about the current science of climate change and the range of potential influences to ecosystems and their subsistence way of life. The University of Alaska Fairbanks (UAF) College of Rural and Community Development (CRCD) serves the educational needs of this region and annually teaches undergraduate lab based science courses, mostly through four small rural campuses located in Bethel, Dillingham, Kotzebue, and Nome. In the Fall 2015 semester, a UAF pilot course entitled: Climate Change in Western Alaska was offered across Alaska. Given the low human population density, limited road network, and expensive transportation of the region, the course was offered using modern distance education methods. The course used the AMS Climate Studies textbook and curriculum, but included local examples and case studies that were tailored to western Alaska. The rapidly changing environment of Western Alaska are happen before important baseline data is even collected. A courses such as this train students to be important recorders of climate change so they can assist in observational research activities such as UAF's Alaska Climate Research Center, Scenarios Network for Alaska and Arctic Planning (SNAP) program, and Alaska Native Tribal Health Consortium's Local Environmental Observer (LEO) Network. Students at UAF rural campuses live daily interacting with weather extremes so they are ideal candidates to cooperate with organizations who need local eyes on the rapid changes occurring.

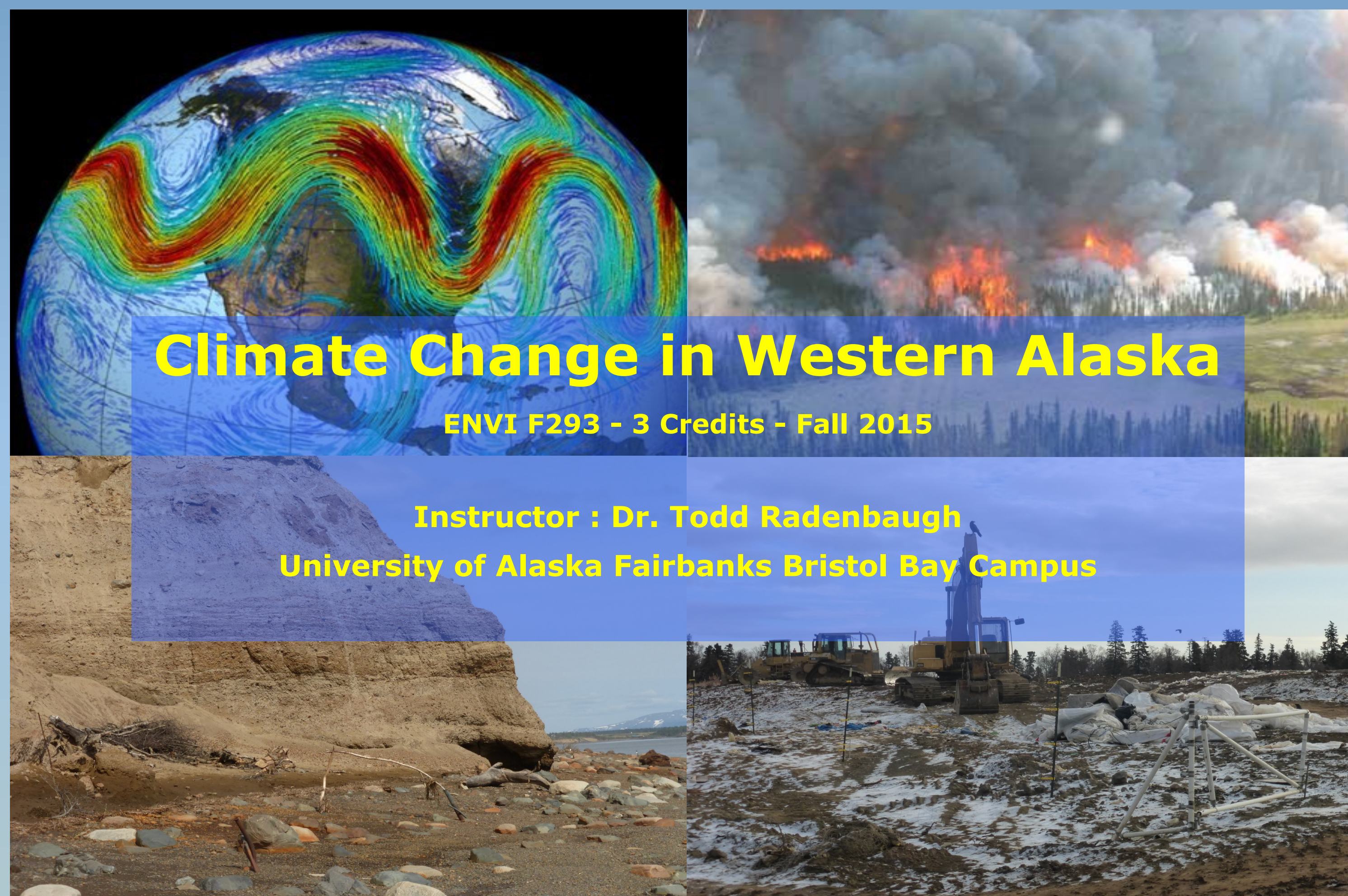


Delivery of Course

The course was delivered using distance education and eLearning techniques.



Blackboard collaborate



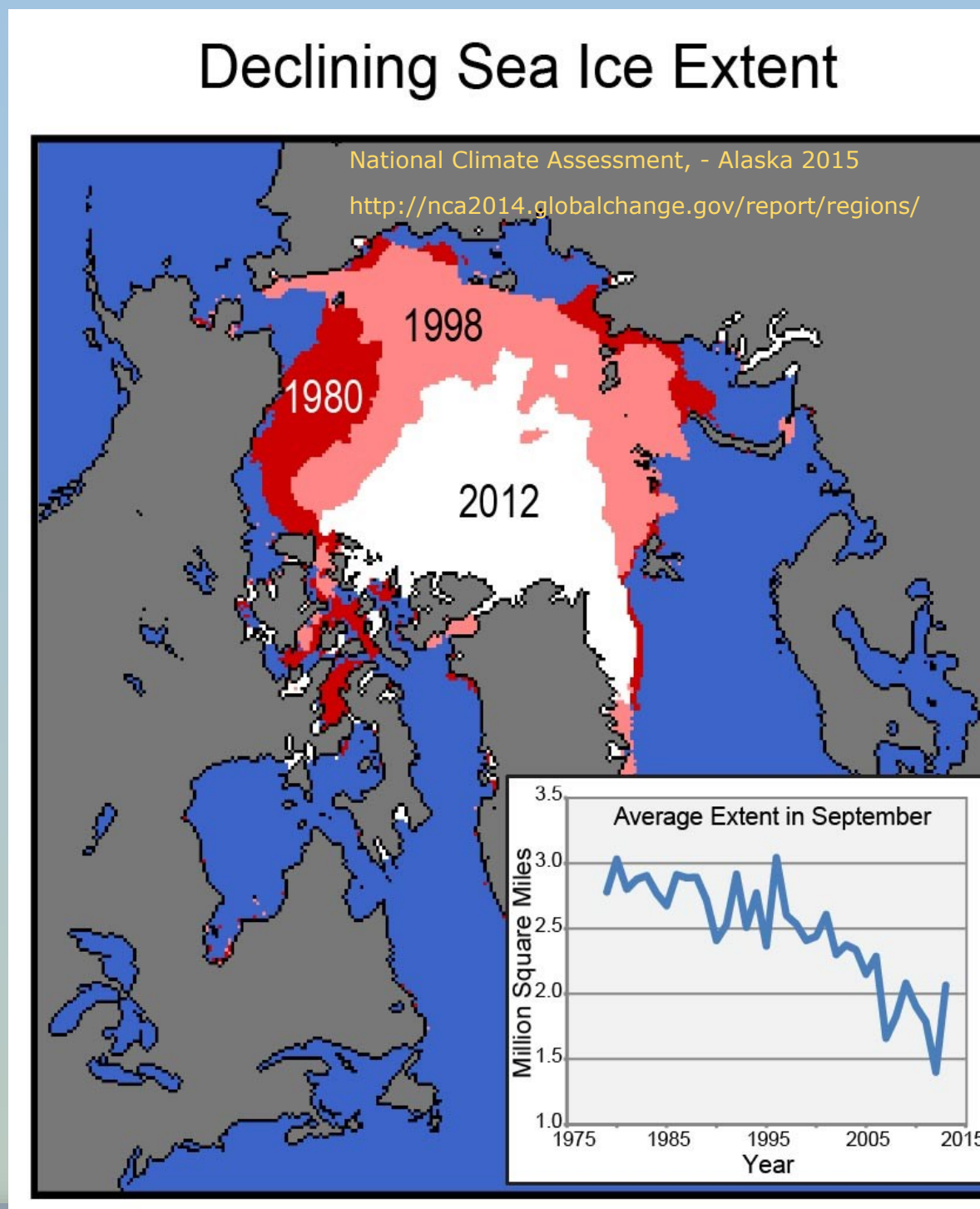
Climate Change in Western Alaska

ENVI F293 - 3 Credits - Fall 2015

Instructor : Dr. Todd Radenbaugh
University of Alaska Fairbanks Bristol Bay Campus

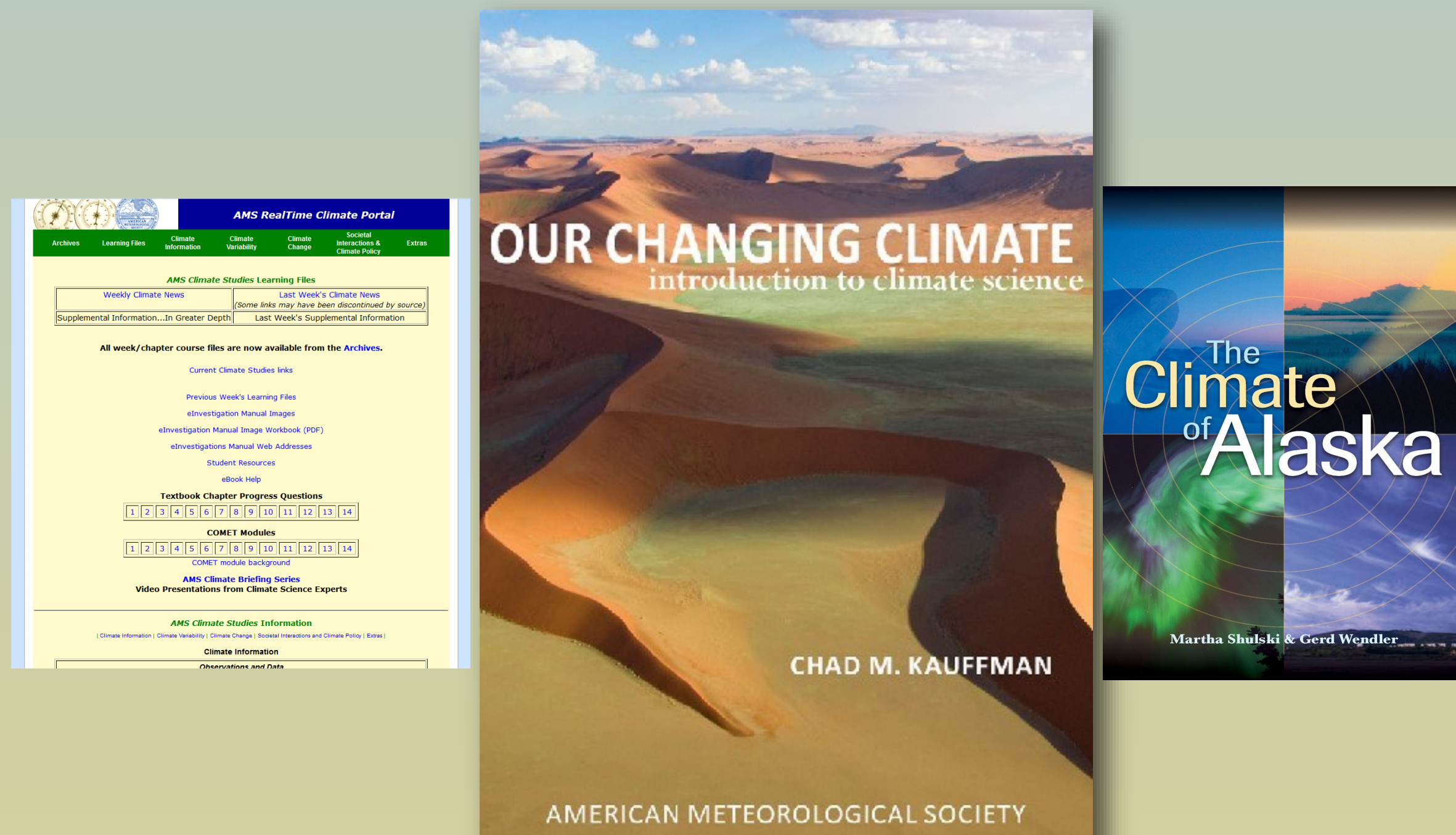
Declining Sea Ice and Coastal Erosion

Coastal erosion creates important social and environmental issues in western Alaska, which is threatening communities.



Textbook

The eTextbook used: *Our Changing Climate: Introduction to Climate Change*, American Meteorological Society
Chand Kauffman and Joseph Moran



Supplementary Reading

- AMS RealTime Climate Portal: A Weekly Climate News reader of current climate related events. by Dr. Edward J. Hopkins
- The Climate of Alaska by Martha Shulski and Gerd Wendler
- The Discovery of Global Warming by Spencer Weart
- United Nations Framework Convention on Climate Change

Subsistence and Natural Resource Use

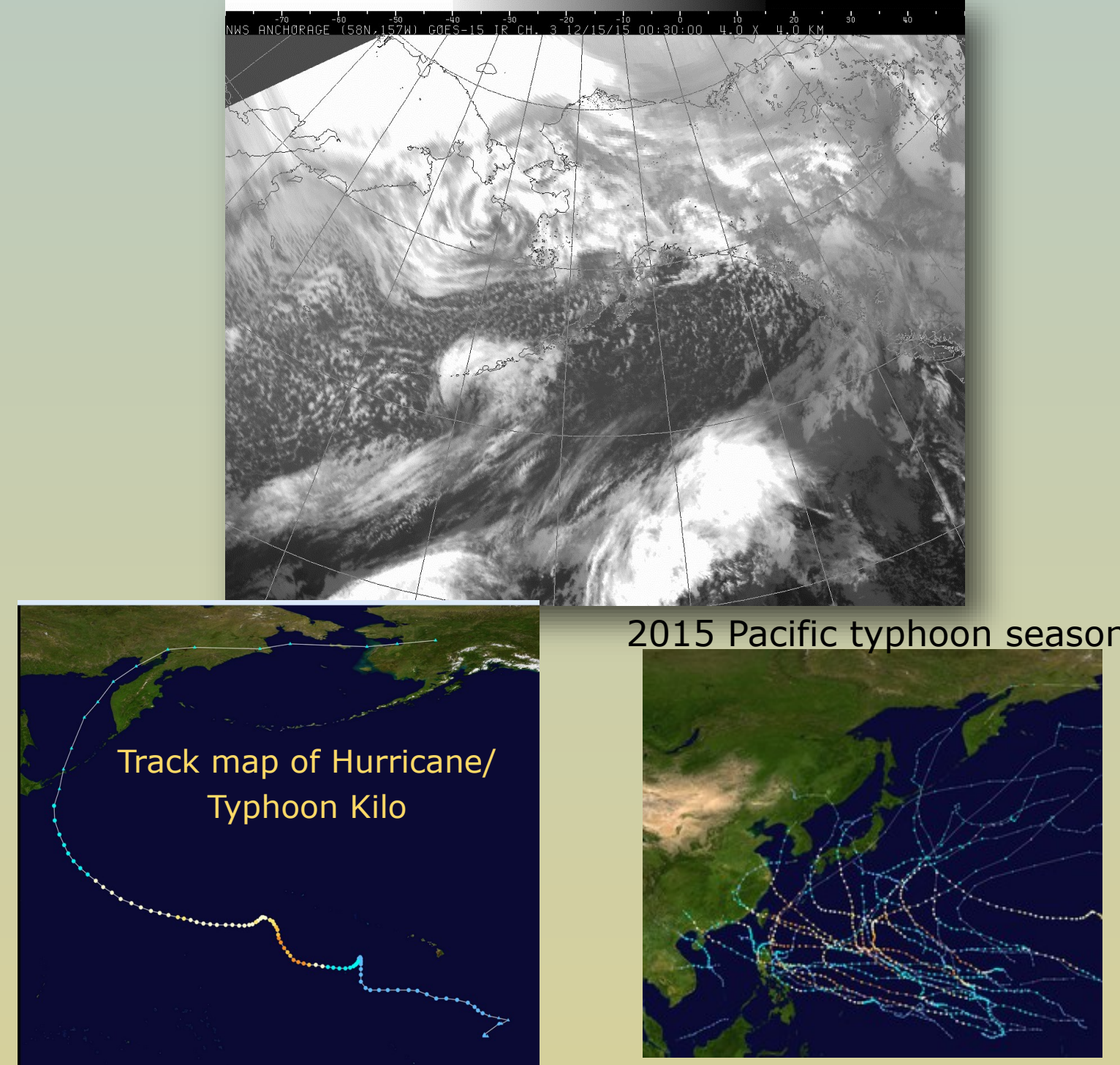
Subsistence foods and natural resources are an essential part of culture in western Alaska. Any changes in the abundance subsistence and natural resources are of great concern and influence the health of local communities.

- Subsistence foods include salmon, caribou, moose, marine mammals, and birds.
- Other natural resources include wood cutting and collection of medicinal plants



Tropical and sub-tropical cyclonic storms

For past 3 years a higher number than average
More and stronger storms influencing Alaska

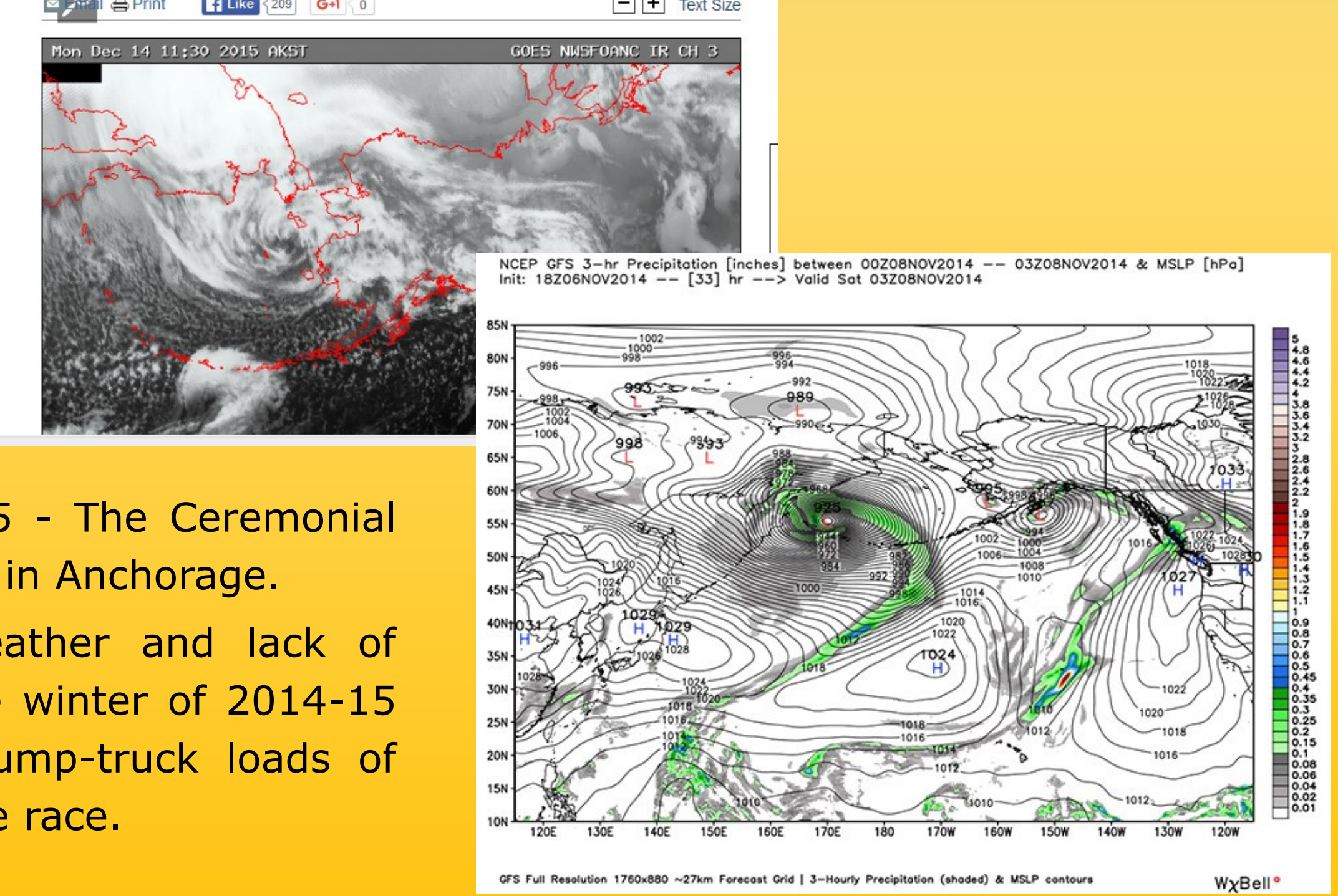
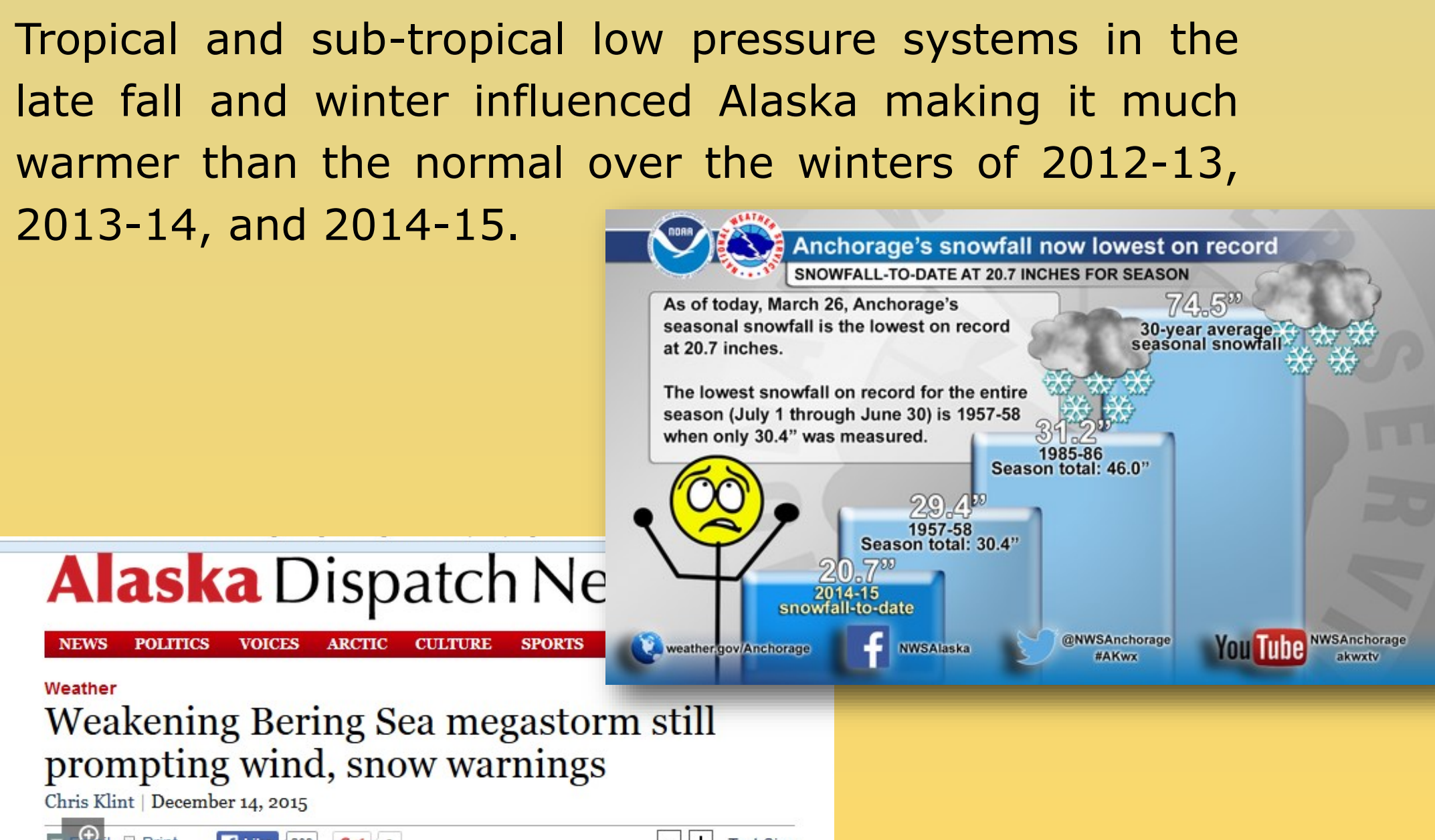
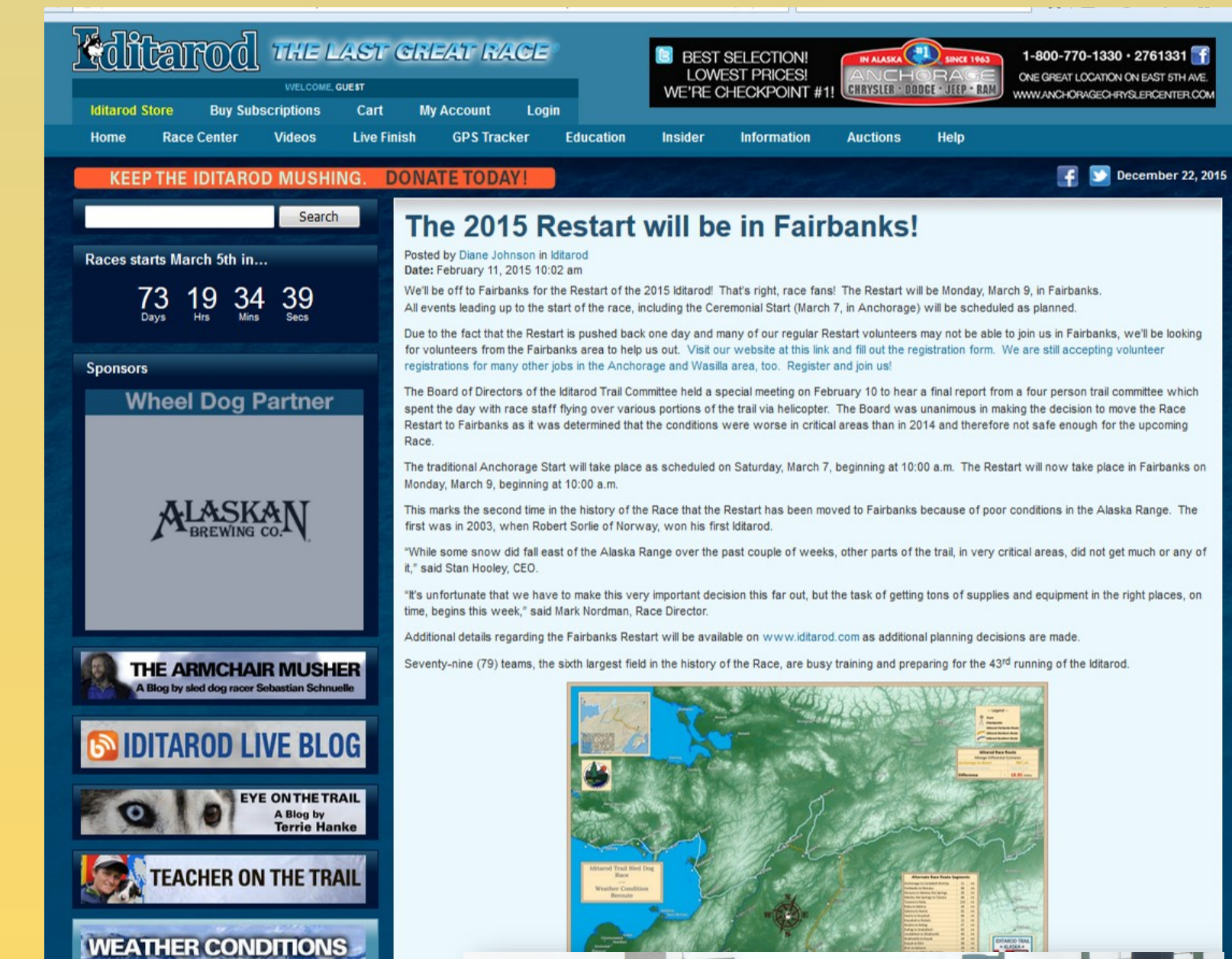


2015—Big year for extratropical cyclones in the North Pacific

- Hurricane/Typhoon Kilo Aug 20/Sept, landed in western Alaska
- Hurricane Ignacio Aug 25, wind bands over the Aleutian Islands
- Typhoon Noul (Dodong) May 2, brushed the Aleutian Islands and GOA
- Typhoon Dolphin May 3, brought up tropical heat
- Typhoon Champi Oct 13, brought up tropical heat

Included Local News and Events

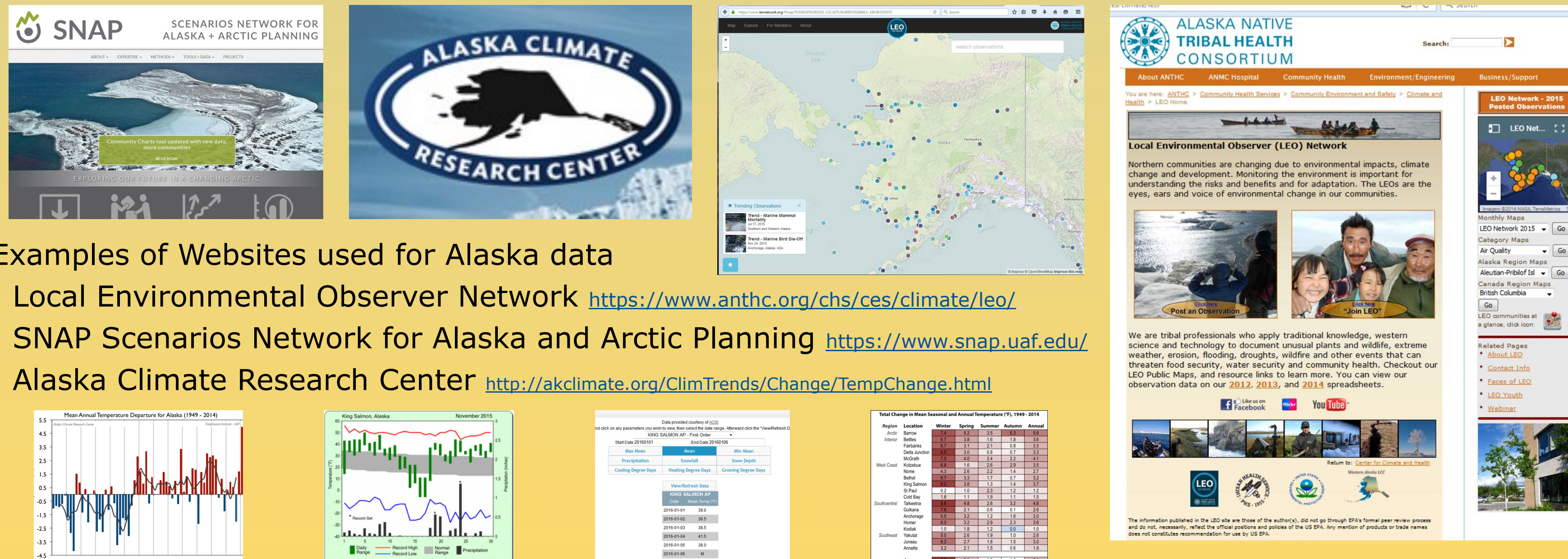
Local events and news sources were used to relate climatic and weather events to course material.



March 7th. 2015 - The Ceremonial Start of Iditarod in Anchorage.
The warm weather and lack of snow during the winter of 2014-15 required 350 dump-truck loads of snow to start the race.

Global to Regional Data and Place-Based Lectures

Many Alaskan data sources were used to supplement lectures to relate course to western Alaska.



Examples of Websites used for Alaska data

- Local Environmental Observer Network <https://www.anthc.org/chs/ces/climate/leo/>
- SNAP Scenarios Network for Alaska and Arctic Planning <https://www.snap.uaf.edu/>
- Alaska Climate Research Center <http://akclimate.org/ClimTrends/Change/TempChange.html>

Using similar data from Alaska to make same point as the AMS textbook, for example:
GCM models for projected summer in Alaska on left and text book's fig for central plain states on right.

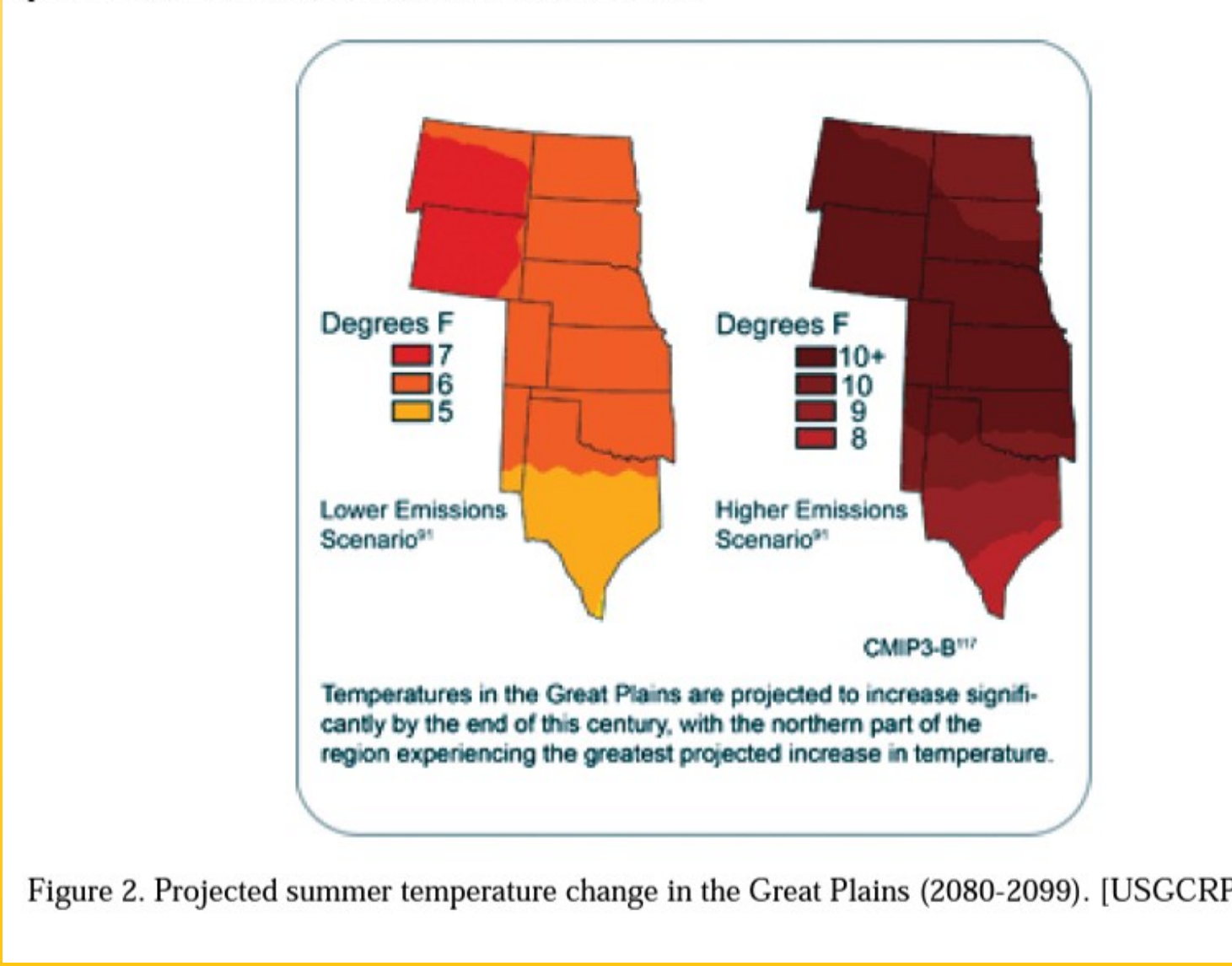
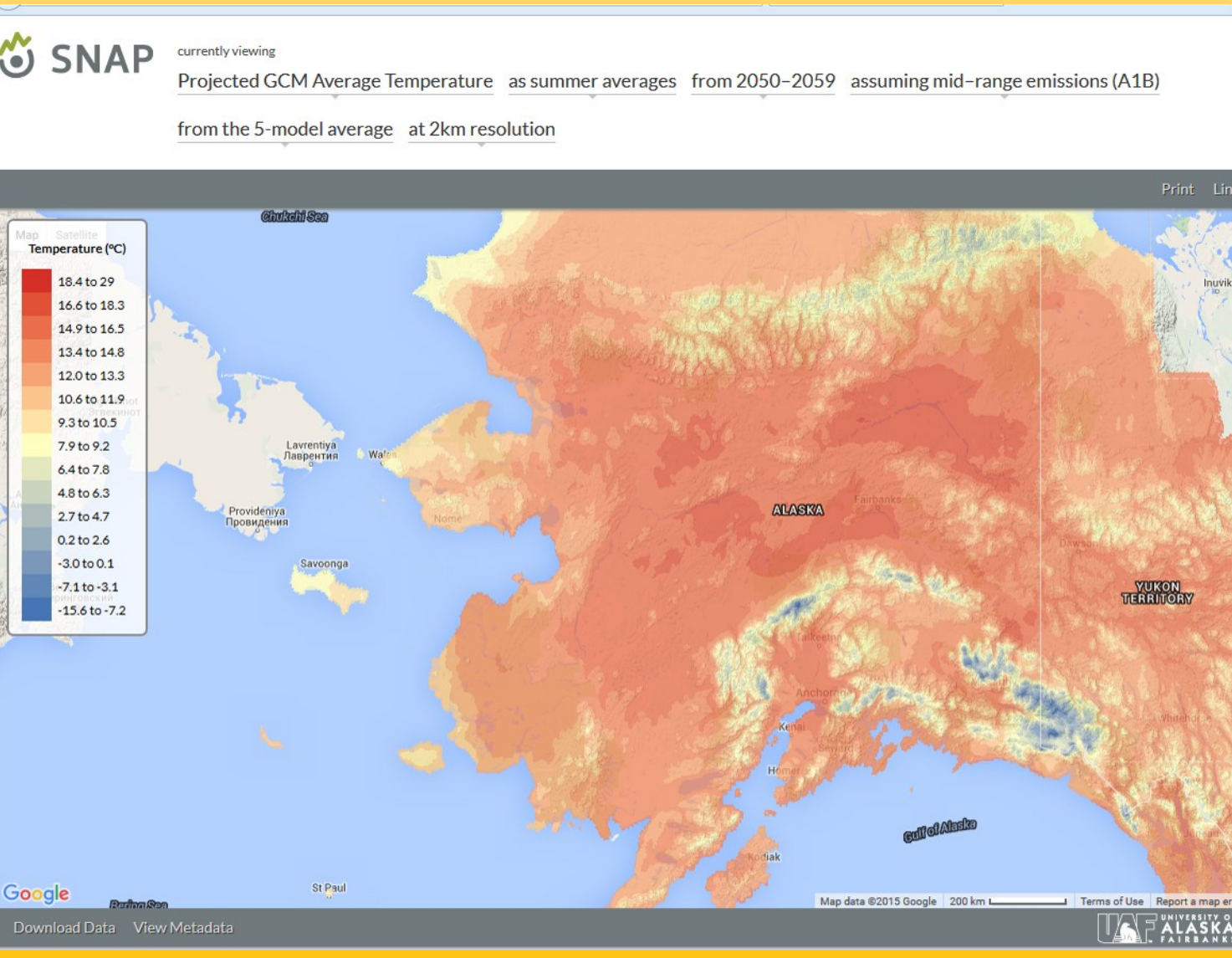


Figure 2. Projected summer temperature change in the Great Plains (2080-2099). [USCCRP]

Syllabus

ENVI 293: Climate Change in Western Alaska



Fall 2015

Dr. Todd Radenbaugh, Associate Professor of Environmental Science

Office: UAF Bristol Bay Campus, Dillingham, AK
E-mail: tradenbaugh@alaska.edu Phone: 907.842.5109
Blackboard webpage: <https://classes.uaf.edu>
Credits: 3 (lecture)
Prerequisites: Any 100 (or above) science class
Office Hours: Mon, Wed, Fri, 2:00-3:00 On by appointment
Lectures Times: Monday and Wednesday, 5:10pm to 6:40pm
Blackboard Collaborate link: Connect through <https://classes.uaf.edu>

Required Text:
• eTextbook: Our Changing Climate: Introduction to Climate Change, American Meteorological Society by Chand Kauffman and Joseph Moran
• Extra Reading - will be assigned by instructor throughout semester including:
• RealTime Climate Portal: A Weekly Climate News reader that investigates the details of current climate related events. Prepared by Dr. Edward J. Hopkins (University of Wisconsin - Madison) <http://www.ametsoc.org/ametsoclogin.cfm> (Requires login)
• The Climate of Alaska by Martha Shulski and Gerd Wendler
• The Discovery of Global Warming by Spencer Weart <http://www.aip.org/history/climate/20cend.htm>
• United Nations Framework Convention on Climate Change <http://unfccc.int/2860.php>

Course Description:
This introductory climate science course focuses on modern causes of climate change and how a rapidly warming world will influence western Alaska. The course is innovative and interactive by using up to date information from the National Aeronautics and Space Administration (NASA) and American Meteorological Society (AMS) to introduce students to the dynamic Earth climate system. By focusing on important geographical and ecological questions that support how and why climate changes, the course also investigates many of the contemporary environmental issues western Alaska must face in a warming world caused by the ways society interacts with functions of Earth systems.

Teaching Methods:
This course is approved by the American Meteorological Society and uses recent data from university and government labs. It consists of synchronous online lectures, demonstrations, videos, assignments and discussions all integrated on the Blackboard and Collaborate toolkits. Weekly online assignments will be done using The American Meteorological Society's climate investigations Manual - The RealTime Climate Portal.

Lecture Attendance and Course Readings
As this is a demanding introductory science course where you will learn many new terms and concepts, lecture attendance is mandatory. As one topic builds on another, getting behind will result in poor performance. You will be required to complete the required reading and assignments on time (this will make learning easier). Most of the lecture topics are discussed in the course textbook, but I encourage having the text available as I may refer to it.

Objectives:
Upon successful completion of this course, students will be expected to:
• Use the scientific method to learn about climatic processes
• Describe the water cycle and its role in weather and climate
• How to critically read and evaluate an article related to climate science
• Explain a relationship between climate change and species diversity. Discover how top predators, such as polar bears, are affected by climate change.
• Calculate your carbon footprint and contributions to GHG emissions.
• Discuss how the culture of western Alaska will be influenced by climate change
Understand the basis of ice ages and the drivers of climate change

Week	Dates	Text Chapter	Topic
1	Sept 9	Ch 1	Earth's Climate as a Dynamic System
2	Sept 14, 16	Ch 2	Observing Earth's Climate System
3	Sept 21, 23	Ch 3	Tools for Investigating Earth's Climate System
4	Sept 28 - 30	Ch 4	Radiation and Heat in the Climate System
5	Oct 5	Exam 1	
6	Oct 7	Ch 5	Water in the Earth's Climate System
7	Oct 12, 14	Ch 5	Water in the Earth's Climate System
8	Oct 19, 21	Ch 6	Global Atmospheric Circulation
9	Oct 26, 28	Ch 7	Atmosphere-Ocean Relationships
10	Nov 2	Exam 2	
11	Nov 4	Ch 8	Natural and Anthropogenic Drivers of Climate Change
12	Nov 9, 11	Ch 8	Natural and Anthropogenic Drivers of Climate Change
13	Nov 16, 18	Ch 9	Paleoclimatic Investigations: Relevancy to the Present State of Climate
14	Nov 23	Ch 10	Past and Present State of Climate
15	Nov 25	Exam 3	
16	Nov 26-29	Thanksgiving Break	
17	Nov 30, Dec 2	Ch 10	Future Projections of Climate
18	Dec 7, 9	Ch 11	Human and Ecosystem Vulnerabilities to Climate Changes
19	Dec 14	Ch 12	Energy and Geopolitical Issues and Review
	Dec 16	Exam 4: Final Essay	

Exams:
There will be three exams and a Final. Exam format will typically be timed, open book, and include a mixture of multiple choice, short answer, fill in the blank, diagrams and maps. There will be comprehensive "Final Exam Questions" that will test if you can put together all that you learned. I will give hints at what these questions will be throughout the semester. This will allow answers to be re-searched, completed, refined, and practiced during the course of the semester.

Grading and Assessment:
Course Grading System:
Course Grading Scale: All grades use the plus (+) and minus (-) letter grade system and determined on an absolute score (with no curve) according to the following:
A- 80-89 percent: outstanding work, mastery of topic
B- 60-79 percent: above average work, all assignments completed
C- 50-59 percent: average, all assignments completed, satisfactory
D- 40-49 percent: pass, some unsatisfactory or missing work
F- less than 40 percent: failure to meet requirements of course

Grade Percentage:
100% - Exam 1
15% - Exam 2
15% - Exam 3
25% - Final Exam 4
25% - individual assignments and group projects
6% - Attendance and class participation
- Climate science is a complex topic. Class attendance and participation is required in order understand course material.
Late Policy: Any homework assignment turned in after the due date will be deducted by 10%. There will be no makeup projects or assignments.

Support and Disability Services:
Student Support Services can be found at: <http://www.uaf.edu/ssss>
UAF has a Disability Services office that operates in conjunction with the College of Rural and Community Development (CRCD) campuses and UAF's Center for Distance Education (CDE) Disability Services, a part of UAF's Center for Health and Counseling, provides academic accommodations to enrolled students who are identified as being eligible for these services. If you believe you are eligible, please visit <http://www.uaf.edu/ssss/disability.html> on the web or contact Disability Services or the Fairbanks Campus at (907) 474-7043 or Contact UAF via the Internet at <http://www.uaf.edu/ssss/disability.html> or by calling the toll free number at 1.800.478.5109.
The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials. The instructor will work with the Office of Disability Services (203 WHIT, 474.7043) to provide reasonable accommodation to students with disabilities.
Library services are available at <http://www.uaf.edu/library> or call the toll free library information number at 1.800.478.5148 and ask for the off-campus librarian.
In compliance with UAF Faculty Senate Resolution 2004
Student Support Disability Services
University of Alaska Fairbanks Bristol Bay Campus Student Services at:
PO Box 1070,
Dillingham, Alaska 99576
907.842-5109, 800-478-5109, Fax: 907.842-5692

Rapidly Retreating Glaciers

Alaskan glaciers are retreating across the State
And Kilbuck mountains in south western Alaska.

