ANAR 120: Documenting Climate Change

Fall 2023

Instructor: Arianna (Ari) Garvin Suero, Ph.D. Candidate in Anthropological Archaeology

Classroom and Class Schedule: Center Hall 207; MWF 3:00-3:50 PM

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Office Hours: Zoom, Mon 4:15-5:15 and Wed 4:15-5:15 PM or by appointment.

Zoom Office Hours Link/ID: https://ucsd.zoom.us/j/91072644777 , 910 7264 4777

Course Description: The contemporary impacts of climate change on societies are a stark reminder of humanity's shared history of dealing with and adapting to climatic extremes. Conversely, learning how ancient people adapted to severe climate phenomena can inform current and future responses to climate change. In this course, we will explore various cross-disciplinary methods that archaeologists employ to document past human resilience to climate crises. I will introduce you to case studies, mainly on Peru's north coast, that dive deep into the range of past human adaptations to El Niño Southern Oscillation (ENSO) events. In turn, you will be expected to develop a project proposal, engaging with different methods to document climate change and test your hypotheses at your chosen site.

In this class, you will:

- Analyze the theoretical perspectives that drive research in the Archaeology of Climate Change.
- Explore and critique cross-disciplinary archaeological methods (household archaeology, geoarchaeology, archaeobotany, zooarchaeology, sea level reconstruction, climate modeling, etc.) to understand past human resilience to climate change.
- Engage with these methods through case studies, activities, lectures, and laboratory visits!
- Learn about opportunities at UCSD and SIO and meet graduate students researching past human responses to climate phenomena.
- Draw connections between past and modern adaptations to climate change.
- Develop a project proposal that explores a research question related to climate change and engages with various methods covered in this course to test hypotheses.

Course Requirements and Grading

Class Prerequisites: Upper division standing. If you are worried about your background in archaeological methods, chat with me!

Grading is based on a 100-point scale. Here is the breakdown:

- Class Attendance and Participation: 10 points
- Lab/Activity Assignments: 35 points
- Project Proposal Rough Draft: 15 points
- Peer Review: 5 points
- Project Proposal Final Draft: 35 points

Attendance is required. In class, I will review critical methods to document climate change and discuss the strategies that I have recently used in the field. (I just returned from conducting eight months of archaeological research in Peru!) PowerPoints will not be posted on Canvas. Moreover, we will get a head start on the Lab/ Activity Assignments in class and offer detailed in-class feedback on project proposal drafts.

Class attendance (5 points) and participation (5 points) reflect 10 points of your grade. Students who attend every class will earn a total of 5 points for attendance, and students who must miss 1 or 2 classes will earn 4 points for attendance. Students who miss more than 3 classes will not receive any points for class attendance. Of course, if you are feeling sick, please do not attend class. In this case, it is best to email me, and we can set up a strategy to complete an alternative assignment and catch up on class material and in-class activities. The 5 points for participation will be calculated based on active engagement with in-class activities and speaking and writing that reflects careful thought and class preparation, always following UCSD's Principles of Community.

Readings in this class are essential, as they introduce and carefully illustrate methods to document climate change. Readings will prepare you for class, so a reading assigned to a particular date should be completed before class time. This class has an interesting yet heavy reading load, and since most methods are cross-disciplinary, you will deal with unfamiliar vocabulary. Please give yourself plenty of time to sit with these readings, and I am always happy to review the readings during my office hours and other individual meeting times. Although I do not require students to complete reading reflections or annotations outside of class, in-class Lab/Activity Assignments will engage with course readings, and lectures will encourage in-class reflections on the readings.

Lab/Activity Assignments: This course includes 7 lab/activity assignments, each worth 5 points. These assignments will involve questions related to course readings, applying methods to document climate change, and brainstorming ideas for your final project proposal. Each activity assignment will be presented during a Friday class, is related to the readings and lectures of that week, and is usually due the following Wednesday. These details are in the course calendar.

Late Work Policy: Deadlines are helpful to keep us on track with the course material and to balance out the work across all classes, so I do include a late-work policy. Generally, if a student submits an assignment 1 day late, they will lose 1 point. If a student submits an assignment 2 days late, they will lose 2 points. After 3 days late, I will not accept the assignment, and the student will earn no points. It is most important, however, for students to communicate with me. I know there are exceptional circumstances for late work. I am always willing to work with my students if they communicate with me and demonstrate a genuine effort to keep up and engage with course material.

Technology: You may take class notes on your computer, notebook, iPad, or whatever method is best for you. However, please do not use phones in class. (I understand if you must take a call, but please step outside to do this.) Class time is only 50 minutes, and these classes will be so much fun if we are all engaged and ready to learn! If I notice a student completing other class material, texting, or on social media, I will speak to them individually. If distractions on computers and phones become a reoccurring problem, the student will see this reflected in their class attendance and participation grade and may be asked to take written notes in class.

In-Person Instruction: This course is offered in person. No student should record lectures unless they have OSD accommodation for audio or video recordings and have discussed this with their instructor. If you must miss class, please meet with me. I am happy to review lecture slides during my office hours!

Lab/Field Notebook: Students must have a lab/field notebook to complete in-class lab activities, write reflections, and take notes during guest lectures and lab visits. Sometimes, you will need 1-mm graph paper, so a notebook with metric paper might be helpful. The notebook I use is the Rite in the Rain, metric field pattern.

Email is the best way to communicate with me. To help me spot your emails, please include detailed subject lines, beginning with the webreg course code, "ANAR 120." To set up a meeting, an email subject might read, "ANAR 120: Scheduling an Individual Meeting." Please give me 1-2 business days to respond. If I don't respond after the second day, please send me a follow-up. Lastly, I do not discuss grades over email, so please see me during office hours or schedule an individual meeting to discuss concerns about grading.

Important Guidelines and Resources

UCSD's Principles of Community: Everyone in this class will follow UCSD's Principles of Community. As the instructor, I will reach out to students who do not meet these standards, which may be reflected in students' final grades.

Academic Integrity, UCSD Policy, and GenAI Tools: Students in this class will submit their own work, finding inspiration from course readings and class activities and discussions. Students are encouraged to bring scholarly ideas and methods into their writing through proper paraphrasing and citations. A large portion of this class will focus on developing students' research questions and ultimately integrating methods we learn about to test student hypotheses.

Any plagiarized or copied work will be submitted to the Office for Academic Integrity and receive a grade point deduction. We will not use ChatGPT and other GenAI tools for any assignment; using these tools in this course is considered cheating. I know there are many temptations, but I invite you to chat with me first to help you develop a work schedule and make your readings, activities, and final project enjoyable. Remember, we are here to learn from each other, and by reading your work, I want to learn from you!

- UCSD Policy on Integrity of Scholarship: https://senate.ucsd.edu/Operating-Procedures/Senate-Manual/Appendices/2
- UCSD Academic Integrity Statement on ChatGPT: https://academicintegrity.ucsd.edu/excel-integrity/ai-in-education.html
- UCSD Academic Integrity Training: https://academicintegrity.ucsd.edu/excel-integrity/ai-training/index.html

Accommodations for Students with Disabilities: Students with disabilities requiring accommodations should directly speak with their instructor after class or during office hours at the beginning of the quarter, during Week 0 or Week 1. Students should work with the Office for Students with Disabilities to present an Authorization for Accommodation (AFA) letter to their instructor.

UCSD COVID-19 Guidelines: https://blink.ucsd.edu/safety/resources/public-health/covid-19/index.html#Masking

UCSD Hub Basic Needs Center offers access to nutritious foods, hygiene products, laptop loans, and housing and financial resources. To learn more, visit: https://basicneeds.ucsd.edu/

UCSD Counseling and Psychological Services (CAPS) offers individual and group counseling, urgent or crisis care, virtual resources, and other helpful programs. To learn more, visit: https://caps.ucsd.edu/

Acknowledgments

The syllabus, course calendar, and class activities are inspired by UCSD classes, conversations, and recommendations from several instructors and archaeologists, including Drs. Paul Goldstein, Jade d'Alpoim Guedes, Isabel Rivera-Collazo, Guillermo Algaze, Daniel Sandweiss, Benjamin Vining, and Jeff Gagnon. I am especially grateful to the previous instructor of ANAR120, Dr. Ian Jones, for the many ideas and to the UCSD Anthropology Department for the opportunity to teach this course.

Please see the Course Calendar below!

*You may see changes in the course schedule/readings.

	Day	Date	Readings/ Class Preparation (due before class time)	Class Topic	Assignments
Week 0	Fri.	Sept. 29	Syllabus and Course Calendar	Welcome! Course Introduction Syllabus and Canvas Review	
Week 1.1	Mon.	Oct. 2	1) van Aalst, Maarten K. 2006 The Impacts of Climate Change on the Risk of Natural Disasters. *Disasters* 30(1): 5-18. 2) Rivera-Collazo, Isabel 2022 Environment, Climate and People: Exploring Human Responses to Climate Change. *Journal of Anthropological Archaeology* 68: 101460. Optional Read on ENSOs: Sandweiss, Daniel H. and Kirk A. Maasch 2020 El Niño as Catastrophe on the Peruvian Coast. Chapter 13 in *Going Forward by Looking Back: Archaeological Perspectives on Socio-ecological Crisis, Response, and Collapse*, edited by Felix Riede and Payson Sheets, 947-1021. New York: Berghahn.	Modern Climate Change and Natural Disasters, Connections to the Past, ENSOs and Case Studies from Peru's North Coast	
Week 1.2	Wed.	Oct. 4	1) Douglass, Kristina and Jago Cooper 2020 Archaeology, Environmental Justice, Climate Change on Islands of the Caribbean and Southwestern Indian Ocean. *PNAS* 117(15): 8254-8262. 2) Carrasco-Torrontegui, Amaya, Carlos Andres Gallegos-Riofrio, Florencia Delgado-Espinoza, and Mark Swanson 2020 Climate Change, Food Sovereignty, and Ancestral Farming Technologies in the Andes. *Current Developments in Nutrition* 5, Supplement 4: 54-60. Optional: Logan, Amanda L. 2016 "Why Can't People Feed Themselves?" : Archaeology as Alternative of Food Security in Band, Ghana. *American Anthropologist* 118(3): 508-524.	Climate Change, Environmental Injustice, Food Insecurity, and the Role of Archaeology	
Week 1.3	Fri.	Oct. 6	1) Van Buren, Mary 2001 The Archaeology of El Niño Events and Other "Natural Disasters *Journal of Archaeological Method and Theory* 8(2): 129 -149. 2) Erickson, Clark L. 1999 Neo-environmental Determinism and Agrarian 'Collapse' in Andean Prehistory. *Antiquity* 73: 634–642. Optional: Turner II, B.L. et al. 2003 A Framework for Vulnerability Analysis in Sustainability Science. *PNAS* 100(14): 8074–8079. Optional: Burke, Ariane et al. 2021 The Archaeology of Climate Change: The Case for Cultural Diversity. *PNAS* 118(30): e2108537118.	Archaeology of Climate Change: Interdisciplinary Studies and Resilience Theory **Activity 1 (due Wed., Oct. 11)**	
Week 2.1	Mon.	Oct. 9	1) Billman, Brian R. 2021 New Directions in Household Archaeology: Case Studies from the North Coast of Peru. Chapter 2 in *Ancient Households on the North Coast of Peru*, edited by Ilana Johnson,	Household Archaeology and ENSO Resilience	

			David Pacifico, and Robyn E. Cutright, pp. 34-67. University Press of Colorado, Boulder. 2) Cutright, Robyn E. 2021 Continuity and Change in Late Intermediate Households on the North Coast of Peru. Chapter 8 in *Ancient Households on the North Coast of Peru*, edited by Ilana Johnson, David Pacifico, and Robyn E. Cutright, pp. 237-258. University Press of Colorado, Boulder. Optional: Zobler, Kari A. 2021 Enduring Collapse: Households and Local Autonomy at Talambo, Jequetepeque, Peru. Chap. 9 in *Ancient Households on the North Coast of Peru*, edited by Ilana Johnson, David Pacifico, and Robyn E. Cutright, pp. 259-287. University Press of Colorado, Boulder.		
Week 2.2	Wed.	Oct. 11	1) Harris, Edward C. 1979. The Laws of Archaeological Stratigraphy. *World Archaeology* 11(1): 111-117. 2) Wells, Lisa E. 1987 An Alluvial Record of El Niño Events from Northern Coastal Peru. *Journal of Geophysical Research* 92(C13): 14,463-14,470. 3) Goodbred Jr., Steven L., Tom D. Dillehay, Cesar Galvez Mora, and Andre O. Sawakuchi 2020 Transformation of Maritime Desert to an Agricultural Center: Holocene Environmental Change and Landscape Engineering in Chicama River Valley, Northern Peru Coast. *Quaternary Science Reviews* 227: 106046.	The Laws of Stratigraphy, Examining Cultural and Geological Deposits	Activity 1 is due by 11:59 PM.
Week 2.3	Fri.	Oct. 13	1) Guilderson, Tom P., Paula J. Reimer, and Tom A. Brown 2005 The Boon and Bane of Radiocarbon Dating. *Science* 307(5708): 362-364. 2) Blaauw, Maarten, and J. Andrés Christen. 2005. The Problems of Radiocarbon Dating. *Science* 308(5728): 1551-1553. **(This includes Guilderson et al.'s response, which you should read!)** 3) Radiocarbon Dating and Archaeology: https://www.radiocarbon.com/archaeology.htm 4) Quick watch on OSL methods: https://www.youtube.com/watch?v=TpZVa7O863A In class: Huckleberry, Gary and Tammy Rittenour 2014 Combining Radiocarbon and Single-Grain Optically Stimulated Luminescence Methods to Accurately Date Pre-ceramic Irrigation Canals, Tucson, Arizona. *Journal of Archaeological Science* 41:156-170.	Dating Techniques: Relative Chronologies, C-14, and OSL dating **Activity 2 (due Wed., Oct. 18)**	
Week 3.1	Mon.	Oct. 16	1) Quick watch: https://www.youtube.com/watch?v=xmZO7aRgcW4 2) Rodriguez, Rodolfo et al. 2005 El Niño Events Recorded in Dry-Fores Species of the Lowlands of Northwest Peru. *Dendrochronologia* 22: 181-186.	Dendrochronology and Extreme Conditions	

Week 3.2	Wed.	Oct. 18	1) Quick watch: https://www.youtube.com/watch?v=_8dzKWfAcwM 2) Sandweiss et al. 2020 Archaeological Climate Proxies and the Complexities of Reconstructing Holocene El Niño in Coastal Peru. *PNAS* 117(15): 8271-8279. 3) Calaway, Michael J. 2005 Ice-cores, Sediments and Civilisation Collapse: A Cautionary Tale from Lake Titicaca. *Antiquity* 79:778-9. Optional, offering more info on Ice Cores and Sediment Cores (history, types of coring, methods) https://iu.pressbooks.pub/zkilibar/chapter/chapter-5-ice-cores-and-climate-change/ In class: Thompson, Lonnie G. et al. 1984 El Niño-Southern Oscillation Events Recorded in the Stratigraphy of the Tropical Quelccaya Ice Cap, Peru. *American Association for the Advancement of Science* 226(4670):50-53. In class: Shimada et al. 1991 Cultural Impacts of Severe Droughts in the Prehistoric Andes: Application of a 1,500-Year Ice Core Precipitation Record. *World Archaeology* 2(3): 247-270.	Ice Cores and Climate Change	Activity 2 is due at 11:59 PM.
Week 3.3	Fri.	Oct. 20	1) Scripps Cored Sediment and Microfossil Collection 2) Winsborough et al. 2012 Paleoenvironmental Catastrophies on the Peruvian Coast Revealed in Lagoon Cores from Pachacamac. *Journal of Archaeological Science* 39: 602-614. Optional, offering more info on Ice Cores and Sediment Cores (history, types of coring, methods) https://iu.pressbooks.pub/zkilibar/chapter/chapter-5-ice-cores-and-climate-change/	Visit Scripps Cored Sediment and Microfossil Collection; Meet at the SIO Deep Sea Drilling Building parking lot. **Activity 3 due Wed., Oct. 25**	
Week 4.1	Mon.	Oct. 23	1) Goldberg, Paul and Richard I. Macphail. 2005 Field-based Methods. Chapter 15 in *Practical and Theoretical Geoarchaeology*, edited by Paul Goldberg and Richard I Macphail, pp. 299-334. Blackwell Publishing, Oxford.	Geoarchaeological Field Methods and Case Studies	
Week 4.2	Wed.	Oct. 25	1) Goldberg, Paul and Richard I. Macphail. 2005 Laboratory Techniques. Chapter 16 in *Practical and Theoretical Geoarchaeology*, edited by Paul Goldberg and Richard I Macphail, pp. 335-367. Blackwell Publishing, Oxford.	Geoarchaeological Lab Methods and Case Studies	Activity 3 is due at 11:59 PM.
Week 4.3	Fri.	Oct. 27		Applying Geoarch. Methods **Activity 4 due Wed., Nov. 1**	
Week 5.1	Mon.	Oct. 30	1) Wright, Patti J. 2010 Methodological Issues in Paleoethnobotany: A Consideration of Issues, Methods, and Cases. In *Integrating*	Microbotanical Analysis and Case Study	

			Zooarchaeology and Paleoethnobotany: A Consideration of Issues, Methods, and Cases, edited by Amber M. VanDerwarker and Tanya M. Peres, pp. 37-58. Springer, New York. **For this class section, focus on the discussion on microbotanical remains in each chapter section.** 2) Caramanica, Ari, Luis Huaman Mesia, Claudia R. Morales, Gary Huckleberry, Luis Jaime Catillo B. and Jeffrey Quilter 2020 El Niño Resilience Farming on the North Coast of Peru." *PNAS* 117(39): 24127 – 24137.		
Week 5.2	Wed.	Nov. 1	1) d'Alpoim Guedes, Jade and Robert Spengler 2014 Sampling Strategies in Paleoethnobotanical Analysis. Chapter 5 in *Method and Theory in Paleoethnobotany*, edited by John M. Marston, Jade d'Alpoim Guedes and Christina Warriner, 77-94. University of Colorado Press, Boulder. 2) White, Chantel E. and China P. Shelton 2014 Recovering Macrobotanical Remains: Current Methods and Techniques. Chapter 6 in *Method and Theory in Paleoethnobotany*, edited by John M. Marston, Jade d'Alpoim Guedes and Christina Warriner, 94-115. University of Colorado Press, Boulder.	Macrobotanical Methods	Activity 4 is due at 11:59 PM.
Week 5.3	Fri.	Nov. 3	1) Dilkes-Hall, India Ella, Jane Balme, Sue O'Connor, and Emiie Dotte-Sarout 2020 Evaluating Human Responses to ENSO Driven Climate Change during the Holocene in Northwest Australia through Macrobotanical Analyses. *The Holocene* 30(12): 1728-1740.	Macrobotanical Analysis Activity in the South American Archaeology Lab **Activity 5 due Wed., Nov. 8**	
Week 6.1	Mon.	Nov. 6	1) Peres, Tanya M. 2010. Methodological Issues in Zooarchaeology. In *Integrating Zooarchaeology and Paleoethnobotany: A Consideration of Issues, Methods, and Cases*, edited by Amber M. VanDerwarker and Tanya M. Peres, pp. 37-58. Springer, New York. 2) deFrance, Susan D. 2005 Late Pleistocene Marine Birds from Southern Peru: Distinguishing Human Capture from El Niño-induced Windfall. *Journal of Archaeological Science* 32:1131-1146.	Zooarchaeology and Climate Change Visit from Ph.D. student Zi-Qi Chew to learn about otoliths!	
Week 6.2	Wed.	Nov. 8	1) Warner, Jacob and Aleksa K. Alaica 2022 Contextualizing the Influence of Climate and Culture on Bivalve Populations: *Donax obesulus* Malacology from the North Coast of Peru. *The Journal of Island and Coastal Archaeology,* DOI: 10.1080/15564894.2021.1991055. 2) Sandweiss et al. 2001 Variation in Holocene El Niño Frequencies: Climate Records and Cultural Consequences in Ancient Peru. *Geological Society of America* 29(7): 603-606.	Malacology and Climate Change **Activity 6 due Wed., Nov. 15**	Activity 5 is due at 11:59 PM.
Week 6.3	Fri.	Nov. 10	VETERANS DAY HOLIDAY, NO CLASS.	VETERANS DAY HOLIDAY	NO CLASS

Week 7.1	Mon.	Nov. 13	1) Fiorentino, Girolamo et al. 2015 Stable Isotopes in Archaeobotanical Research. *Vegetation History and Archaeobotany* 24: 215-227. 2) Zangrando, Francisco A. et al. 2014 Applications of Stable Isotope Analysis in Zooarchaeology: An Introduction. *International Journal of Osteoarchaeology* 24:127-133. 3) Andrus, C. Fred T. et al. 2002 Otolith O Record of Mid-Holocene Sea Surface Temperatures in Peru. *Science* 295:1508-1511.	Stable Isotopes in Archaeobotanical and Zoological Studies	
Week 7.2	Wed.	Nov. 15	1) Bailey, Geoff and Hayley C. Cawthra 2023 The Significance of Sea-level Change and Ancient Submerged Landscapes in Human Dispersal and Development: A Geoarchaeological Perspective. *Oceanologia* 65: 50-70. 2) Galili Ehud, Jonathan Benjamin, Vered Eshed, Baruch Rosen, John McCarthy, Liora Kolska Horwitz 2019 A submerged 7000-year-old Village and Seawall Demonstrate Earliest Known Coastal Defence Against Sea-level Rise. *PLoS ONE* 14(12): e0222560. 3) Rodriguez-Delgado, Eric, Marisol Rodriguez-Miranda, and Isabel Rivera-Collazo 2023 Modeling Holocene Coastal Ecosystem Availability and Site Distribution Patterns for Boriken, Puerto Rico. *The Holocene* 33(3):321-334.	Sea Level Reconstruction Visit from Ph.D. candidate Eric Rodriguez-Delgado!	Activity 6 is due at 11:59 PM.
Week 7.3	Fri.	Nov. 17	1) Vining, Benjamin, Aubrey Hillman, Daniel A. Contreras, and Ernesto Tejedor 2022 Expanded Agroecological Niches and Redistributed Risks in Northern Peru's Chicama Valley during late-Holocene ENSO Climate Changes. *The Holocene* 32(12):1393-1409.	Paleohydroclimate and Agroecology Models **Activity 7 due *Mon., Nov. 20**	
Week 8.1	Mon.	Nov. 20	1) Tully, Gemma 2007 Community archaeology: general methods and standards of practice. *Public Archaeology* 6(3): 155-187. 2) Douglass, Kristina 2019 Toward a just and inclusive environmental archaeology of southwest Madagascar. *Journal of Social Archaeology* 19(3): 307-332. 3) Rivera-Collazo, Isabel C., Cristina Rodríguez-Franco, José J. Garay-Vázquez, Héctor M. Rivera-Claudio, and Rubén Estremera-Jiménez. 2020 Towards a Definition and Practice of Communal Archaeology: Ethics, Informal Learning, and Citizen Science in the Practice of Indigenous Archaeology. *Journal of Community Archaeology & Heritage,* DOI: 10.1080/20518196.2020.1712002	Communal Archaeology and Indigenous Knowledge Systems, Project Proposal Expectations	Activity 7 is due at 11:59 PM.
Week 8.2	Wed.	Nov. 22	No class today 😊 Enjoy the holiday! And take some time to write! Remember, the Project Proposal Rough Draft is due Thursday, Nov. 30th.	No class 😉	
Week 8.3	Fri.	Nov. 24	THANKSGIVING HOLIDAY, NO CLASS.	THANKSGIVING HOLIDAY	

Week 9.1	Mon.	Nov. 27	Write! Project Proposal Rough draft due Thurs., Nov. 30	Writing Project Proposals: Research questions, hypotheses, methods Zoom class: **:** https://ucsd.zoom.us/j/91072644777	
Week 9.2	Wed.	Nov. 29	Write! Project Proposal Rough draft due Thurs., Nov. 30	Examples of Project Proposals	
	Thurs.	Nov. 30			Proposal Rough Draft is due by 11:59 PM.
Week 9.3	Fri.	Dec. 1		In-Class Peer Reviews of Project Proposals	Peer Reviews are due by 11:59 PM.
Week 10.1	Mon.	Dec. 4	Write! Project Proposal Final Draft due Friday, December 8, 2023	Refining Hypotheses, Correlates, and Implications	
Week 10.2	Wed.	Dec. 6	Write! Project Proposal Final Draft due Friday, December 8, 2023	Integrating Methods	
Week 10.3	Fri.	Dec. 8		Final Feedback on Project Proposals	Final Proposal is due by 11:59 PM.