CHARLES H. FLETCHER, curriculum vitae

interim Dean, School of Ocean and Earth Science and Technology (SOEST) Chair, Honolulu Climate Change Commission University of Hawai'i at Mānoa, 1680 East-West Road, Honolulu, HI 96822 (808) 956-2582 ph, (808) 294-0386 cell; fletcher@soest.hawaii.edu

EDUCATION

Albion College BA, Geology (1979) University of Delaware, MS Geology (1982), PhD Geology (1986)

EMPLOYMENT HISTORY

<i>interim</i> Dean, SOEST
Associate Dean for Academic Affairs – SOEST
Chairperson, Department of Geology and Geophysics, UH Mānoa
Professor, Department of Earth Sciences, UH Mānoa
Associate Professor, University of Hawai'i at Mānoa
Assistant Professor, University of Hawai'i at Mānoa
Assistant Professor, West Chester State University (PA)

INSTRUCTION

ERTH101 Dynamic Earth

ERTH420/620 Beaches, Reefs, and Climate Change; Coastal Geology

RESEARCH ACTIVITIES *https://www.soest.hawaii.edu/coasts/*

Climate change science & impacts, SLR impact modeling, Pacific island adaptation, Atoll reef island geo-history, Coastal processes & hazards, Paleoclimatology, Reef paleoecology & geo-history, Coastal Zone Management

PRINCIPAL ADVISOR all grant supported on 12 mo. RA's

- 25 Undergraduate scholars
- 33 Graduate students (MS and PhD)
- 6 Post-doctoral scholars

selected RESEARCH GRANTS 01/01/2017 - Current, 17 awards; TOTAL \$9,980,258

- 2021 Climate Resilience Initiative, ONR (\$4M)
- 2019 Applied Marine Research to Support Management of Papahānaumokuākea Marine National Monument (\$419,286), Dept. Interior, USFW
- 2018 Updating the Hawaii Historical Shoreline Database: Modeling Past, Present, and Future Shoreline Change (\$225,000), Dept. Commerce, NOAA

PUBLICATIONS https://www.soest.hawaii.edu/coasts/index.php/publications/

81 peer-reviewed journal articles, 3 textbooks, 2 lab manuals, 3 chapters, 3 edited professional volumes, and 22 sponsored government reports and proceedings papers (see bibliography)

CITATIONS

- Career: 5705 cumulative citations, h-index 44, i10-index 95
- Since 2017: 2338 citations, h-index 22, i10-index 56

selected CONSULTANCIES

- 2021 Raimi + Associates, Kaua'i Equitable Climate Resiliency Plan
- 2020 Belt-Collins, South Maui Community Plan Update
- 2019-Current Board of Advisors, First Insurance Co. of Hawaii, Honolulu, HI
- 2016-2018 Board Water Supply, Honolulu, Impacts & Mitigation Climate Change on Honolulu Water Supplies
- 2016-2018 Office of Planning, Hawai'i, Feasibility & Implications of Managed Retreat Strategies

AWARDS

2019	ThinkTech Hawaii, Community Service Award
2018	O'ahu Surfrider Foundation, John Kelly Lifetime Achievement Award
2018	Pacific Risk Management Ohana (Primo) PRiMO Leadership Award

- 2011 UH Mānoa Chancellor's Citation for Meritorious Teaching
- 2011 U.S. Environmental Protection Agency, Environmental Achievement Award in Climate Science
- 2006 Hung Wo and Elizabeth Lau Ching Foundation Award for Faculty Service to the Community
- 2004 UH Manoa Chancellor's Office "Leading Researcher at UHM"
- 2002 Fellow, The Geological Society of America
- 2001 UH Mānoa Chancellor's Citation for Meritorious Teaching
- 2001 Robert W. Clopton Award for Outstanding Service to the Community, University Hawai'i Regents
- 2001 Board of Land and Natural Resources, Resolution in Recognition of Distinguished Public Service

recent KEYNOTES

- 2021 Keynote, Global Maritime Forum Annual Summit, Climate Crisis: The Pivotal Decade, 9/22/21
- 2021 Keynote, Public Environmental Forum, Global Perspectives on Climate Change, 5/8/21
- 2020 Horton Lecture (annual), Albion College, March 19, 2020
- 2020 Keynote, SPEAK a coalition of K-8 schools in San Francisco joined to enhance parent education.
- 2020 Keynote, Asian Development Bank, sea level rise employee training
- 2019 Keynote, Resilient Atoll Nations in Productive Oceans, Male', Maldives
- 2019 Keynote, CA Association Independent Schools, Annual Conference, Santa Barbara
- 2018-2019 Keynotes, Republic of the Marshall Islands, 2nd and 3rd National Dialogs on Climate Change, Ebeye

recent, selected COMMUNITY SERVICE

- 2021 3 workshops on climate change, New Jersey Association of Independent Schools, 10/5-14-21/21
- 2021 US Fish & Wildlife, invited lecture, Biodiversity loss, Pandemics, and Climate change, 8/10/21
- 2021 Fed Bank, Board of Governors, invited lecture, Climate Change: No, It's Not Solved, 5/30/21
- 2021 Fed Bank, SFO, 3 lectures, Climate Change: Basics (5/14/21), Impacts (5/16/21), Solutions (5/20/21)
- 2020 American Shoreline Podcast Network, <u>Evolving Coastal Management</u> in Hawaii with Dr. Chip Fletcher
- 2019 Sea Level Rise Learning Trip Science leader for 10 Honolulu & State of Hawai'i department heads to Miami, Miami Beach, Charleston & Boston to meet key agencies & exchange best practices
- 2017-2021 Design Team, University of Hawai'i at Mānoa Administrative Re-organization. Team Lead: 1) Office of Research, Graduate Education, and Scholarship; 2) Office of Climate, Equity, and Conflict Resolution.

APPLIED RESEARCH

In Anderson et al (2018¹), my research team projects annual wave run-up, coastal erosion, and hydrostatic flooding under 98 cm of sea level rise (IPCC AR5 RCP8.5) at the end of the century. Model projections are publicly available as GIS .shp and .tiff files through an online map server.² The combined footprint of these hazards, called the 3.2sea level rise exposure area (3.2SLRXA), has been adopted by Honolulu, Maui, and Kauai counties, and the state of Hawai'i, as formal hazard overlay regions. The following laws have been passed based on this research: HB243³ requires state agencies to identify facilities in the 3.2SLRXA and publish plans for adaptation to flooding; SB474⁴ makes Hawai'i the first state to codify sea level rise real estate disclosure by requiring sellers to disclose whether their property lies within the 3.2SLRXA and thus acknowledge the property is at risk from sea level rise; SB2060⁵ requires more stringent review of building permits in the 3.2SLRXA, outlaws seawalls on sandy beaches, and increases the shoreline setback. In addition, our projections are the basis for shoreline setback laws on Maui⁶ and Kaua'i⁷ (and soon O'ahu).

¹ Anderson, T., Fletcher, C.H., et al. (2018) Modeling multiple SLR stresses reveals up to 2X the land at risk compared to strictly passive flooding methods. Nature Sci. Rep. 8: 14484 DOI:10.1038/s41598-018-32658-x

² https://www.pacioos.hawaii.edu/shoreline/slr-hawaii/

³ https://www.capitol.hawaii.gov/measure_indiv.aspx?billtype=HB&billnumber=243&year=2021

⁴ https://www.capitol.hawaii.gov/measure_indiv.aspx?billtype=SB&billnumber=474&year=2021

⁵ https://www.capitol.hawaii.gov/Archives/measure_indiv_Archives.aspx?billtype=SB&billnumber=2060&year=2020

⁶ https://www.mauinews.com/news/local-news/2018/09/shoreline-setback-rules-draw-line-in-the-sand/

⁷ https://kauai.granicus.com/MetaViewer.php?meta_id=146846

CHARLES H. FLETCHER, BIBLIOGRAPHY

selected 2021 NATIONAL & LOCAL COMMENTARY

- 1. The Hill, Opinion, COP26 has failed our children political compromise cannot be the answer, 11/17/21
- 2. **The Hill**, Opinion (invited): July was so hot it convinced Republicans climate change is real but they're still getting it wrong, 8/17/21
- 3. The Hill, Opinion (invited): It's not enough to cut emissions we need economic development that does not destroy nature, 6/01/21
- 4. Civil Beat, Commentary: When Will Joe Manchin Care About Global Warming? 10/28/21
- 5. PBS Hawai'i, Insights on PBS Hawaii (1 hr. TV Broadcast) Community Discussion: Beach Erosion & Restoration
- 6. **Amicus Brief** in Support of Appellees and Remand (invited), U.S. Court of Appeals for the 9th Circuit: City & County of Honolulu-County of Maui vs. Sunoco LP, *et al.*
- 7. **Chair**, Honolulu Climate Change <u>Commission</u>; author of 4 guidance papers: 1) Climate Change Brief, 2) Sea Level Rise Guidance, 3) Shoreline Setback Guidance, 4) Urban Heat Guidance

TEXTS

- <u>Climate Change</u>: What the Science Tells Us 2nd Edition, 2019, J. Wiley & Sons, 352p.
- <u>Physical Geology</u>: The Science of Earth 3rd Edition, 2017, J. Wiley & Sons, 600p.
- <u>Living on the Shores</u> of Hawai'i: Nat Hazards, the Environ, and Our Communities, 2011, Univ Hawai'i Press, 384p.

selected **PEER-REVIEWED JOURNAL ARTICLES** *Fletcher student

- 1. Harmon, K., Winter, K., Kurashima, N., *Fletcher, C.H.*, et al. (2021) The role of indig. practices in expanding waterbird hab. in the face of SLR. **Anthropocene**, 34, 100293. https://doi.org/10.1016/j.ancene.2021.100293
- 2. Gesch D., Palaseanu-Lovejoy M., Danielson J., *Fletcher C.H.*, et al. (2020) Inundation exposure assess. Majuro Atoll, RMI using a high-accuracy DEM. **Remote Sensing**. 12(1):154. https://doi.org/10.3390/rs12010154
- 3. Tavares* K., *Fletcher C.H.*, et al. (2020) Risk of shoreline hardening and associated beach loss peaks before midcentury: O'ahu, Hawai'i. **Nature Scientific Reports**, 10:13633. DOI:10.1038/s41598-020-70577-y
- 4. Habel*, S., *Fletcher, C.H.*, et al. (2020) Sea-Level Rise Induced Multi-Mechanism Flooding and Contribution to Urban Infrastructure Failure. **Nature Scientific Reports**, 10: 3796 DOI:10.1038/s41598-020-60762-4
- 5. Kane*, H. H., *Fletcher, C.H.* (2020) Rethinking reef island stability in relation to anthropogenic SLR. Earth's Future, 8, e2020EF001525. https://doi.org/10.1029/2020EF001525
- 6. Habel*, S., *Fletcher, C.H.*, et al. (2019) Comp. hydrostatic & 3D num. model method simulating SLR induced groundwater inundation for Honolulu, HI. **Env. Res. Comm.**, 1(4), 041005. DOI:10.1088/2515-7620/ab21fe
- 7. Anderson*, T., *Fletcher, C.H.*, et al. (2018) Modeling multiple SLR stresses reveals up to 2X the land at risk compared to strictly passive flooding methods. **Nature Sci. Rep.** 8: 14484 DOI:10.1038/s41598-018-32658-x
- 8. Summers*, A., *Fletcher, C.H.*, Spirandelli, D., et al. (2018) Failure to protect beaches under slowly rising sea level. Climatic Change 151, 427–443. https://doi.org/10.1007/s10584-018-2327-7
- 9. Vitousek*, S., Barnard, B.L., *Fletcher, C.H.*, et al. (2017) Doubling of coastal flooding frequency within decades due to sea-level rise. Nature Scientific Reports 7: 1399 DOI:10.1038/s41598-017-01362-7
- 10. Kane* H., *Fletcher C.H.*, et al. (2017) Coastal plain stratigraphy records tectonic, environ, & human habitability changes related to sea-level drawdown, 'Upolu, Sāmoa. **Quat. Res.**, 87, 246–257 doi:10.1017/qua.2017.2
- 11. Habel*, S., *Fletcher, C.H.*, et al. (2017) Develop. of a model to simulate groundwater inundation induced by SLR and high tides in Honolulu, Hawaii. **Water Res**. ISSN 0043-135.http://dx.doi.org/10.1016/j.watres.2017.02.035
- 12. Spirandelli D., Anderson* T., Porro R., *Fletcher, C.H.* (2016) Improv. adaptation plan. for SLR: Understanding uncert. & risk using probability-based shoreline model. J. Plan. & Res. 1-14. DOI: 10.1177/0739456X16657160
- 13. Habel*, S., *Fletcher, C.H.*, et al. (2016) The influence of seasonal patterns on a beach nourishment project in a complex reef environment. **Coastal Eng.** v.116, p.67–76 http://dx.doi.org/10.1016/j.coastaleng.2016.06.006
- 14. Romine*, B.M., *Fletcher*, *C.H.*, et al. (2016) Beach erosion under rising sea-level modulated by coastal geomorph & sediment avail on carbonate reef-fringed island coasts. **Sedimentology**. DOI 10.1111/sed.12264
- Cochrane, E. E., Kane*, H., *Fletcher C.H.*, et al. (2015) Lack of suitable coastal plains likely influenced Lapita (2800 cal. BP) settlement of Sāmoa: Evidence from SE 'Upolu. The Holocene. DOI: 10.1177/0959683615596841
- 16. Anderson*, T.R., *Fletcher, C.H.*, Barbee*, M.M., Frazer, L.N., Romine, B.M. (2015) Doubling of coastal erosion under rising sea level by mid-century in Hawaii. **Natural Hazards**. DOI 10.1007/s11069-015-1698-6

- 17. Kane* H.H., *Fletcher C.H*, Frazer L.N., et al. (2015) Modeling sea-level rise vulnerability of coastal environments using ranked management concerns. **Climate Change**. DOI 10.1007/s10584-015-1377-3
- 18. Kane* H.H., *Fletcher C.H.*, Frazer N., Barbee*, M. (2015) Critical elevation levels for flooding due to sea-level rise. **Regional Environmental Change**. DOI 10.1007/s10113-014-0725-6
- 19. Sherman*, C.E., *Fletcher*, *C.H.*, et al. (2014) Sea-level and reef accretion history of MIS 7 and late MIS 5 based on age & facies of submerged late Pleistocene reefs, Oahu, Hawaii. **Quaternary Research** 81: 138-150
- 20. Romine*, B.M., *Fletcher, C.H.*, Barbee*, M.M., Anderson*, T.R., and Frazer, L.N. (2013) Are beach erosion rates and sea-level rise related in Hawaii? **Global and Planetary Change**, 108: 149-157
- 21. Cooper*, H.M., *Fletcher, C.H.*, Chen, Q. and Barbee*, M.M. (2013) Sea-level rise vulnerability mapping for adaptation decisions using LiDAR DEMs. **Progress in Physical Geography**, 001-22, 22 p.
- 22. Rotzoll*, K. and *Fletcher, C.H.* (2012) Assessment of groundwater inundation by sea level rise; **Nature Climate Change**, 3, 477-481, DOI:10.1038/NCLIMATE1725
- 23. Engels*, M.S., *Fletcher, C.H.*, Field, M., Conger*, C.L., Bochicchio*, C. (2008) Demise of reef-flat carbonate accumulation with late Holocene sea-level fall: evidence from Molokai, Hawaii. **Coral Reefs**.
- 24. Frazer, L.N., Anderson*, T.R., *Fletcher, C.H.* (2009) Modeling storms improves estimates of long-term shoreline change. **Geophysical Research Letters**, v. 36, L20404.
- 25. Anderson*, T.R., Frazer, L.N., *Fletcher, C.H.* (2009) Transient and persistent shoreline change from a storm. **Geophysical Research Letters**, v. 37, L08401 and AUX MATERIALS
- 26. Conger*, C.L., *Fletcher, C.H.*, Hochberg, E.J., Frazer, N., Rooney*, J.J., (2009) Remote sensing of sand distribution patterns across an insular shelf: Oahu, Hawaii. **Marine Geology**, vol. 267, no. 3-4: 175-190.
- 27. *Fletcher C.H.*, et al. (2005) Age and origin of Late Quaternary eolianite, Kaiehu Pt. (Moomomi), Molokai, HI. J. Coastal Res. SI 42, p. 97-112.
- Rooney* J., Fletcher C.H., et al. (2004) El Niño influence on Holocene reef accretion, HI. Pac. Sci. v.58.2, p. 305-324.
- 29. Rubin K.H., *Fletcher C.H.*, Sherman* C. (2000) Fossiliferous Lana'i deposits formed by multiple events rather than a single giant tsunami. **Nature**, p. 675-681, v. 408, Dec. 7.
- 30. Grossman* E.E., *Fletcher C.H.* (1998) Sea level 3500 years ago on the Northern Main Hawaiian Islands. **Geology**, April, v. 26, no. 4, p. 363-366
- 31. *Fletcher C.H.*, Jones, A.T. (1996) Sea-level highstand recorded in Holocene shoreline deposits on Oahu, HI. **Journal of Sedimentary Research**, 66.3, p. 632-641.
- 32. *Fletcher C.H.*, et al. (1995) Marine flooding on the coast of Kauai during Hurricane Iniki: Hindcasting inundation components and delineating washover. **Journal of Coastal Research**, 10.4, p. 890-907.
- 33. *Fletcher C.H.*, et al. (1993) Tidal wetland record of Holocene sea-level movements and climate history. **Paleogeography, Palaeoclimatology, Paleoecology**, v. 102, p. 1-37.
- 34. *Fletcher C.H.*, Pizzuto, J., John, S., and van Pelt*, J. (1993) Sea-level rise acceleration and the drowning of the Delaware Bay coast at 1.8 ka. **Geology**, 21, p. 121-124
- 35. *Fletcher C.H.*, Fairbridge, R., Moller, J., and Long, A. (1993) Emergence of the Varanger Peninsula, Norway and Climate since Deglaciation. **The Holocene**, v. 3.2, p. 116-127.
- 36. *Fletcher C.H.*, (1992) SL Trends & Physical Consequences: Applications to U.S. **Earth-Science Reviews**, v. 33, p. 1-36.
- 37. *Fletcher C.H.*, Knebel, H.J., Kraft, J.C. (1992) Holocene depocenter migration and sediment accumulation in Delaware Bay, a submerging marginal marine sedimentary basin. **Marine Geology**, v. 103, p. 165-183.
- Fletcher C.H., et al. (1990) Holocene evolution of an estuarine coast & tidal wetlands. Bull Geol Soc Am, 102.283– 297
- Fletcher C.H. (1988) Holo SL hist & neotectonics of US Mid-Atl reg: applications & corrections. J Geol, v.96, p.323-337