

I Università luav -- di Venezia U --A





Living on the Water

Towards 2100 - Sea level Science in Venice

Venice has been facing challenges from its coastal environment since it was founded. Sedimentation has threatened its vital waterways in the past, and subsidence along with high waters began affecting buildings and streets. Today, rising sea levels are expected to worsen flooding,

necessitating engineering solutions to protect the lagoon's heritage. In June 2025, Venice will become the center of global climate research hosting **three international events** focused on sea-level change.















SUMMER SCHOOL

Climate Change in coastal areas: knowledge, resilience, adaptation

> June 12-17th, 2025 - Palazzo Loredan, Sala delle Adunanze

Scientific Committee: Carlo Barbante, Alessio Rovere, Andrea Rinaldo, Florence Colleoni, Barbara Stenni, Marco Marani, Francesco Musco

Lead Organisers: Alessio Rovere, Davide Zanchettin, Giulia Lucertini, Denis Maragno, Filippo Magni

The International Center for Climate Change Studies, a newly established institute bringing together Venetian universities and research centers, is organising its inaugural summer school. This program is designed for Early Career Scientists (ECRs) and will feature lectures conducted by international experts. The program's objective is to equip young scientists with the understanding of the dynamic interactions between atmosphere, ocean and land that shape the evolution of coastal zones, alongside with an understanding of dynamic adaptation, resilience and urban planning

CONFERENCE

WARMCOASTS: sea level and extreme waves in the Last Interglacial

> June 18th, 2025 - Ca' Dolfin, Saoneria, Venice

Lead Organisers: Alessio Rovere, Elisa Casella, Silas Dean, Ciro Cerrone, Ali Mubashir

WARMCOASTS is a project funded by the European Research Council to understand changes in sea level, rapid ice-sheet collapse and subsequent sea-level rise and extreme storms in the Last Interglacial. This is the last period that the Earth was slightly warmer than today and represents an important calibration for future climate projections. The project will end in September 2025. Besides highlighting the project results, the conference day will host some of the most prominent scientists working on this period, who will present their recent research.

WORKSHOP

Warmer coasts in a warming world: predictions, processes, and proxies, from past to present

> June 19th - 21st, 2025 - Auditorium Danilo Mainardi, Campus Scientifico, Mestre

Lead Organisers: Matteo Vacchi, Gaia Mattei, Marta Pappalardo, Patrizia Ferretti, Alessandro Fontana

Scientific committee: Juliet Sefton, Roger Creel, Holly Han, Tamara Pico, Claudia Caporizzo, Ana Novak, Matthieu Giaime, Driss Chahid.

Workshop fee: 100 euros

This workshop is organised by the working groups PALSEA and ONSEA. It will bring together researchers from diverse disciplines spanning sea level science, glaciology, solid Earth dynamics, geomorphology, and archaeology to explore how sea-level change has shaped coastal environments through time. Featuring scientific sessions, a field trip, and collaborative discussions, the workshop aims to advance interdisciplinary integration by fostering dialogue that meshes observations and modeling. This workshop will strengthen the scientific basis for understanding past, present, and future ice sheet and sea level changes, emphasizing the connections between environmental processes and human responses. Researchers from all career stages are encouraged to participate.

Living on the water is sponsored by the International Centre for Climate Change Research and Studies, funded by the Italian Ministry for University and Research. PALSEA is sponsored by the International Union for Quaternary Research (INQUA), Past Global Changes (PAGES) and INSTANT (Instabilities and Thresholds in Antarctica). ONSEA is sponsored by INQUA. The meeting falls under the purview of AIQUA and AIGEO. The WARMCOASTS project is sponsored by the European Research Council (ERC) under the European Union's Horizon 2020 Research and Innovation Programme (grant agreement n. 802414).

FULL PROGRAM

Towards 2100 - Sea level Science in Venice

Summer School

Climate Change in coastal areas: knowledge, resilience, adaptation

June 12-17th, 2025

Istituto Veneto di Scienze, Lettere ed Arti, Palazzo Loredan, sala delle adunanze - Campo Santo Stefano, 2945, Venezia

Thursday, June 12th

Morning: Arrival of participants

Afternoon: Ice sheet melting and sea-level changes at

different timescales

13.00 - 14.00 Welcome and registration

14.00 -15.00 Sea-level and ice sheet changes in the Plio-Pleistocene

Prof. Maureen E. Raymo (LDEO, Columbia University, USA)

15.00 - 16.00 Sea-level changes in the Last Interglacial: meaning for future scenarios

Prof. Alessio Rovere (Ca' Foscari University of Venice, Italy)

16.00 - 17.00 Sea-Level changes and the solid Earth Prof. **Jerry X. Mitrovica** (Harvard University, USA)

17.00 - 19.00 Ice breaker party

Friday, June 13th

Morning: historical, modern and future sea-level changes 9.00 - 10.00 Sea-level and ice sheet changes in the Holocene

Prof. **Benjamin P. Horton** (City University of Hong Kong, HK)

10.00 - 11.00 The instrumental record of sea-level changes

Prof. **Marta Marcos** (University of the Balearic Islands, Spain)

11.00 - 12.00 Future sea-level and ice sheet projections Prof. **Robert M. DeConto** (University of Massachusetts Amherst, USA)

12.00 - 14.00 Lunch break

Afternoon: past and future coastal processes 14.00-15.00 Climate Change Risk Assessment for Transformative Adaptation

Teachers: Dr. **Silvia Torresan** and Dr. **Elisa Furlan** (CMCC, Italy)

15.00-16.00 Flooding and storm surges: future projections

Prof. Piero Lionello (University of Salento, Italy)

16.00-17.00 The COP goals: meaning for coastal areas Dr. Florence Colleoni (OGS Trieste, Italy)

Saturday June 14th - Sunday June 15th

Saturday June 14th

Free time to explore the city

Sunday June 15th

Tour of Venice via water - Lido, Mose, Bocche di Porto, Lazzaretto Vecchio and Sant'Erasmo, with lunch included

Monday, June 16th

Morning: regional perspectives

9.00 - 10.00 Climate-driven future wave projections in the Mediterranean

Prof. Giovanni Besio (University of Genoa, Italy)

10.00 - 11.00 Assessing Coastal Vulnerability to Medicanes: Propagation Effects and Implications Prof. Giovanni Scicchitano (University of Bari, Italy)

11.00 - 12.00 Unfit for the Future: Climate Change Is Here. Science, Innovation, and the Urgency of Adaptation Prof. Marco Marani (University of Padua, Italy)

12.00 - 14.00 Lunch break

Afternoon: Sea Level changes and Coastal Subsidence in Venice

14.00 - 15.00 Sea-level and ice sheet changes in the Common Era

Prof. Jennifer S. Walker (Rowan University, USA)

15.00-16.00 Subsidence and sea-level rise in Venice Prof. **Davide Zanchettin** (Ca' Foscari University of Venice, Italy)

16.00-18.30 Venice towards 2100 - a tour of the city Prof. **Davide Zanchettin** and Prof. **Alessio Rovere** (Ca' Foscari University of Venice, Italy)

Tuesday, June 17th

Morning: Impacts of sea-level rise

9.00 - 10.00 Guided tour of Palazzo Loredan

10.00 - 11.00 Sea level rise and impacts on coastal Agricolture

Prof. Giulia Lucertini (IUAV University of Venice, Italy)

11.00 - 12.00 Sea-level rise and impacts on coastal environments

Prof. Fabio Pranovi (Ca' Foscari University of Venice, Italy)

12.00 - 14.00 Lunch break

Afternoon: Adaptation to sea-level rise

14.00-15.00 Impacts of sea level rise on urbanized coastal areas

Prof. **Franco Montalto** (Drexel University of Philadelphia, USA)

15.00-16.00 A long history of geoarcheology and sea level Prof. **Matteo vacchi** (University of Pisa, Italy)

16.00-17.00 Adaptation experience in the venetian Coast Dr. Pierpaolo Campostrini (CORILA) and Manuela Manfredi (Thetis)

Conference

WARMCOASTS: sea level and extreme waves in the Last Interglacial

June 18th, 2025

Ca'Dolfin - Saoneria. Dorsoduro 3825D - Venezia

8.00 - 9.15 Welcome and registration (Breakfast included)

9.15-9.30 Welcome to Ca' Foscari and its research excellence

Prof. María del Valle Ojeda Calvo, Dean for research, Ca' Foscari University of Venice, Italy)

9.30 - 10.00 The WARMCOASTS Project: 5(+1.5) years in and out of the Last Interglacial

Prof. Alessio Rovere (Ca' Foscari University of Venice, Italy)

10.00 - 11.00 Two decades of lessons learned from studying Last Interglacial sea level

Prof. Andrea Dutton (University of Wisconsin-Madison, USA)

11.00 - 12.00 The Last Interglacial in Argentina

Prof. Sebastian Richiano (CONICET Puerto Madryn, Argentina)

12.00 - 13.00 Lunch Break

13.00 - 14.00 What do we know about MIS5e relative sea levels in Antarctica?

Prof. Alexander Simms (University of California Santa Barbara, USA)

14.00 - 14.15 Modelling reefs in the Last Interglacial

Dr. Denovan Chauveau (IFREMER Brest, France)

14.15 - 14.30 Holocene and Last Interglacial sea-level changes in South America

Dr. Karla Rubio-Sandoval (UNAM, Mexico)

14.30 - 14.45 Last Interglacial sea-level changes along the Argentinian coasts

Dr. **Deirdre D. Ryan** (University of Pisa, Italy)

14.45 - 15.00 Last Interglacial sea level on the North American Atlantic coasts

15.00 - 15.45 Coffee break

Dr. Silas Dean (Ca' Foscari University of Venice, Italy)

15.45 - 16.00 Last Interglacial sea level in the Gulf of Mexico

Dr. Nikos Georgiou (Ca' Foscari University of Venice, Italy)

16.00 - 16.15 Last Interglacial sea-level changes in Brazil

Dr. Ciro Cerrone (Ca' Foscari University of Venice, Italy)

16.15 - 16.30 Last interglacial sea-level indicators from South Asia and the South China Sea

Dr. Ali Mubashir (Ca' Foscari University of Venice, Italy)

16.00 - 17.00 Coffee break

17.00 - 18.00 What's next: from WARMCOASTS to HISEAS

Prof. Blake Dyer (University of Victoria, Canada) - To Be Confirmed

18.00 - 18.10 Projection of the video "WARMCOASTS: Sea level and extreme waves in a warmer world"





This workshop has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement no. 802414)

Workshop

Warmer coasts in a warming world: predictions, processes, and proxies, from past to present

June 19th - 21st, 2025

Auditorium Danilo Mainardi, Campus Scientifico Via Torino (Edificio ALFA)

Thursday, June 19th

SESSION 1

Sea-Level and Palaeo-Shoreline Reconstructions: Quantifying changes during the late Quaternary using geological, archaeological, and biological indicators.

Invited speaker: Nicole Khan (Hong Kong University, HK)

SESSION 2

Ice Sheet Dynamics and Earth Response: Insights from ice sheet modeling and glacial isostatic adjustment processes. **Invited speaker**: Dr. Florence Colleoni (OGS Trieste, Italy)

Evening: Tour of local "Bacaro" and social night out in Venice

Friday June 20th

SESSION 3

Environmental and Climatic Reconstructions: Proxy-based studies using foraminifera, pollen, and ostracods to track environmental change.

Invited speaker: Paolo Montagna (CNR ISP, Bologna, Italy)

SESSION 4

Coastal Archaeology and Submerged Landscapes: Geoarchaeological investigations of ancient coastal settlements and submerged prehistoric landscapes.

Invited speaker: Prof. Alessandro Fontana (University of Padua, Italy)

Evening: Social Dinner in Forte Marghera

Saturday June 21st

The field trip aims to show to the participants two major aspects that are testified along the coast of the Northern Adriatic:

- 1. the deposits of the marine highstand which characterised the Last Interglacial (MIS 5.5)
- 2. the sea-level variations occurred during the Holocene, focusing on the role of eustasy, subsidence, pre-existing topography and their interplay with the ancient and modern anthropogenic activities.

In the **first stop** some of the reference stratigraphic cores of the Venice area will be shown, with the aim to describe and discuss the deposits forming the coastal wedge accumulated during the Last Interglacial. In that period the sea level arrived some meters above the present one, but now the lagoon deposits of that phase are some tens of meters below in the subsoil because of the subsidence going on in the area.

Along the itinerary we will visit the coastal plain between the eastern Lagoon of Venice and the Lagoon of Caorle. In particular, specific stops are planned in the area of Altinum, Carole and Concordia Sagittaria for visiting some of the index points which constrain the Holocene sea-level rise. Altinum was a Roman city at the north-eastern corner of the Lagoon of Venice. The settlement is considered the ancestor of Venice because during the early Middle Age the people escaped the barbarian invasion seeking refuge in the middle of the lagoon. The urban centre was crossed by an artificial canal connected to the port and the lagoon, with a pier still visible, allowing to reconstruct the position of the sea around the 1st century CE.

North of Caorle a large area has been reclaimed between the end of the 19th and the first half of the 20th century, transforming the former lagoon into farmland, eradicating the malaria disease and peopling the zone. We will stop in "La Frassina", a farm where we will have a light lunch with possibility to taste the local foods and the wines, now produced at -2m below mean sea level. In the area the drainage system is maintained by pumping stations, a dense network of ditches and canals and a lagoon dike. In this area the lagoon arrived about 5000 years ago and the expansion of the brackish environment was constrained by the pre-existing alluvial plain.

In the afternoon the visit of the area of Concordia Sagittaria is planned, with the description of the deep incised valley that was formed by the Tagliamento River between Late Glacial and early Holocene. The valley was over 1 km wide and up to 20 m deep and this depression started to feel the effects of the marine transgression since around 9000 years ago. It was lately invaded by lagoon waters around 7000 years ago, forming an estuary that elongated for over 20 km upstream of the coeval coastline. Since that period the former fluvial valley was progressively filled by brackish deposits that testify the sea-level rise occurred in the area. Prehistoric settlements developed along the estuary and Concordia Sagittaria was already an important settlement since the end of Bronze Age and became a Roman city in the 1st century BCE, displaying a strong relationship with the lagoon environment that surrounded it. The floods of the 6th century CE sealed the zone with 4 m of sands and silts, allowing the extraordinary preservation of the ancient landscape. We will visit the archaeological area of the palaeo-Christian basilica, now at -3 m below m.s.l. covered by 4 meters of Medieval deposits.

The end of the field trip is at the airport of Venice (at about 16:30, traffic allowing) and later to the railway station of Mestre-Venezia (at about 17:00, traffic allowing)



PALSEA ONSEA preliminary program

June 19th - 20th, 2025

Thursday, June 19th

8.30 - 9.00 Registration of Participants

9.00 - 9.15 Introduction to the Meeting

9.15 - 9.30 Laura Sadori, President of INQUA

SESSION 1

Sea-Level and Palaeo-Shoreline Reconstructions Quantifying changes during the late Quaternary using geological, archaeological, and biological indicators

Conveners: Claudia Caporizzo and Juliet Sefton (TBC)

9.30 - 10.00 Keynote: **Nicole Khan** (The University of Hong Kong)

10.00 - 10.20 Holocene relative sea-level change from raised beaches at Bunger Hills, East Antarctica Jacinda O'Connor (Monash University, Australia)

10.20 - 10.40 Timing and magnitude of an intra-MIS 5e sea-level fall on West Caicos

Kyle Fouke (University of Texas at Austin)

10.40 - 11.10 Coffee Break

11.10 - 11.30 Reconstructing late Holocene relative sealevel change in Southern Brazil

Ed Garret (University of York)

11.30 - 11.50 HOLSEA Datahub: An open-source portal for sea-level research

Yi-Fei Gu (The University of Hong Kong)

11.50 - 12.10 New sea-level constraints on MIS3: from Scotland to California

Alexander Simms (University of California Santa Barbara)

12.10 - 12.30 Late-Holocene sea-level change on the east coast of South Africa

Lauren Pretorius (Durham University & University of KwaZulu-Natal)

12.30 - 13.00 Lunch Break

SESSION 2

Ice Sheet Dynamics and Earth Response Insights from ice sheet modelling and glacial isostatic adjustment

Conveners: Tamara Pico and **Roger Creel** (TBC)

14.00 - 14.30 – Keynote: **Florence Colleoni** (National Institute of Oceanography and Applied Geophysics, Italy)

14.30 - 14.50 3D viscosity structure and GIA in Patagonia Lawren Lewright (Columbia University)

14.50 - 15.10 Continental levering and Pennsylvanian sealevel cycles

Sophie Coulson (University of New Hampshire)

15.10 - 15.30 Constraining ice sheet models with Pliocene sea-level data

Ed Gasson (University of Exeter)

15.30 - 15.50 Interactions among GIA, ocean circulation, subglacial hydrology, and ice sheets

Linda Pan (Princeton University)

15.50 - 16.10 Greenland Ice Sheet contributions to Last Interglacial sea-level highstand

Casey Vigilia (University of Texas at Austin)

16.10 - 16.30 RoSETTA: Resolving sea-level, ecosystems, and tectonics

Yannick Boucharat (Grenoble University)

16.30 - 16.50 Sensitivity of sea-level measurements to mantle structure

Natasha Valencic (Harvard University)

16.50 - 17.50 Poster Session

Friday, 20th June

SESSION 3

Environmental and Climatic ReconstructionsProxy-based studies to track environmental change

Conveners: **Marta Pappalardo** and **Ciro Cerrone** (TBC)

9.00 - 9.30 **Paolo Montagna** (Italian National Research Council)

9.30 - 9.50 Interglacial highstand on Mediterranean islands

Laura Calabrò (University of New Mexico)

9.50 - 10.10 Submerged barchans in the Gulf of Trieste Erica Golob (University of Ljubljana)

10.10 - 10.30 Holocene beachrocks of Morocco: Petrography and dating

Driss Chahid (University Cady Ayyad, Morocco)

10.30 - 11.00 Coffee Break

11.00 - 11.20 Sea-level rise, sedimentation, and blue carbon in UK salt marshes

Roland Gehrels (University of York)

11.20 - 11.40 Modelling coastal terraces in NW Haiti Santiana Vissiere (Geo-Ocean, CNRS, Ifremer)

11.40 - 12.00 Improving palaeoshoreline elevation estimates via denudation

Blaz Miklavic (University of Guam)

12.00 - 12.20 Coastal erosion and shoreline changes in NE Brazil

Luca Lämmle (University of Campinas, Brazil)

12.30 - 14.00 Lunch Break

SESSION 4

Coastal Archaeology and Submerged Landscapes Geoarchaeological investigations of ancient coastal settlements and submerged landscapes

Conveners: Gaia Mattei and Matthieu Giaime (TBC)

14.00 - 14.30 Keynote: **Alessandro Fontana** (University of Padova)

14.30 - 14.50 Thetysstrombus latus distribution in Tunisia and Mediterranean

Amel Chakroun (University of Tunis El Manar)

14.50 - 15.10 Sea-level curve reconstruction for NW Black Sea and Neolithic settlements

Alfred Vespremeanu-Stromae (University of Bucharest)

15.10 - 15.30 **Geoarchaeology of the port of Nora, Sardinia Filippo Carraro** (University of Padova)

15.30 - 15.50 Moroccan Atlantic archaeological sites Aïcha Oujaa (National Institute of Archaeological Sciences, Morocco) 15.50 - 16.10 Holocene palaeoenvironment and RSL in the N Adriatic lagoons

Mattia Azzalin (University of Padova)

16.10 - 16.30 Marine caves and MIS 5 reconstructions in Cilento using ML

Alessia Sorrentino (Parthenope University)

16.30 - 17.30 Poster Session

17.30 - 18.30 PALSEA and ONSEA Working Group Meetings

POSTER

Alfredo Di Paolo, University of Pisa

High-resolution mapping of the beachrock outcrops of southern Corsica

Blake Dyer, University of Victoria

Fingerprinting melt contributions during the Last Interglacial period

Christine Authemayou, GEO-OCEAN laboratory, BREST university, FRANCE

Erosion of Cuba's low-lying coastal terraces by extreme wave events and by carbonate dissolution

Ciro Cerrone, Ca' Foscari University of Venice

Reoccupation of late Quaternary relative sea-level indicators and multiple Last Interglacial stillstands along the Mt. Bulgheria coast, southern Apennines (Italy): insights from the Cilento headland

Deirdre D. Ryan, University of Pisa

Last Interglacial sea-level indicators at Balzi Rossi, Italy, a site of Palaeolithic significance

Denovan Chauveau, IFREMER, France

Last interglacial sea-level oscillations: Insights from coral reef stratigraphic forward modelling

Gabriella Raffa, University of Pisa

MIS4 to 3 palaeo-landscape reconstruction at Balzi Rossi archaeological complex (NW Italy): how can sea-level research support understanding the transition from Neanderthal to Anatomically Modern Human populations in Europe?

Gianluca Borracini, Ca' Foscari University of Venice and University of Pisa

Constraining late-Cenozoic oscillations of the Antarctic Ice Sheet by combining multiple cosmogenic nuclides and landscape analysis in southern Victoria Land

Gino De Gelder, ISTerre, IRD, Université Grenoble-Alpes Deciphering coastlines with a new Rosetta Stone: climatic, tectonic and environmental evolution of the Gulf of Corinth

Giovanni Fasciglione, Parthenope, University of Naples Present and future coastal exposure to flooding under sea level rise pressure, on Volturno coastal plain

Karla Rubio-Sandoval, Instituto de Geociencias, UNAM Drivers of Pleistocene to Holocene sea-level changes in the Southwestern Atlantic

Kathrine Maxwell, Senckenberg am Meer

WAD was - WAD can we do? An action plan for ecosystembased land-sea transition zones

Luca Lämmle, University of Campinas, Brazil

Recent shoreline changes due to coastal erosion in northeastern Brazil: causes and consequences

Luisa Sabato, Dipartimento di Scienze della Terra e Geoambientali, Università degli Studi di Bari Aldo Moro The "Bosco Pantano di Policoro" littoral system in Basilicata (Southern Italy): a case-study for the protection of sandy coasts

Marcello Tropeano, Dipartimento di Scienze della Terra e Geoambientali, Università degli Studi di Bari Aldo Moro Development of Quaternary coarse-grained coastal systems and relative sea-level changes in the hinterland of the Taranto Gulf (Basilicata, Southern Italy)

Marco Anzidei

Istituto Nazionale di Geofisica e Vulcanologia

Sea level rise, land subsidence and extreme events in the Venice Lagoon: from the past to the next future

Marta Pappalardo

Department of Earth Sciences, University of Pisa Constraining in age and elevation the mid-Holocene relative sea-level highstand along the southern coast of the Arabian Peninsula (Sultanate of Oman)

Md Monzer Hossain Sarker, University of Groningen

Transition of coastal ecosystems in the Wadden Sea Region: a social-ecological perspective

Mubashir Ali, Ca' Foscari University of Venice

Last interglacial (MIS 5e, 125 ka) sea-level indicators from South Asia

Muhammad Usman, University of Bologna

Increasing Coastal Ecosystem Resilience to Climate Change through Cross-Border Cooperation (ACTION Project)

Nikos Georgiou, Hellenic Hydrocarbons & Energy Resources Management Company

Beach ridges as proxies for paleoclimate and sea level: re-evaluating a Holocene-Pleistocene composite coastal barrier system on the Northern Gulf of Mexico

Sam Chester, Columbia University

Exploring interactions between ice sheets and sea level change using a newly coupled ice sheet (PISM) - GIA model

Samuel Kodama, University of California, Santa Cruz Glacial isostatic adjustment drives spatiotemporal trends of meander migration rate in a former glacial lake basin

Sebastian Richiano, CONICET-UNPSJB

Major environmental changes since last interglacial (MIS 5) in South-Western Atlantic (SWA): evidence from the fossil record in Patagonia

Serin Lim, Chonnam National University, Department of Geological & Environmental Sciences

First discovery of MIS 3 tidal deposits along the southwest coast of Korea: implications for high relative sea-level during the last glacial

Silas Dean, Ca' Foscari University of Venice

Sea-level and Luminescence Results from the Last Interglacial and Other Highstands in Virginia and South Carolina

Stephen Chua, Earth Observatory of Singapore, NTU New constraints on deglacial sea-level rise for Singapore

Tae Soo Chang, Chonnam National University, Department of Geological & Environmental Sciences How high higher-than-present sea-levels during the Last Interglacial in the southwestern coast of Korean Peninsula?

Tamara Pico, University of California, Santa Cruz Sea-ing is Believing: Dating the Last Bering Land Bridge With Converging Evidence From Sea Level, Palaeoceanography and Ancient DNA

Tom Bartles-Smith, Durham University

A multi-proxy reconstruction of Holocene relative sea level from isolation basins in the Windmill Islands, East Antarctica, using isolation basins sediment