Summary of the 2022 Ocean Salinity Conference

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1. Summary

Ocean salinity is a key variable within the Earth's water cycle and a key driver of ocean dynamics. Sea surface salinity (SSS) and subsurface salinity have been identified as Essential Climate Variables by the Global Climate Observing System (GCOS) and Essential Ocean Variables by the Global Ocean Observing System (GOOS). Through the advent of new observing technologies for salinity and the efforts to synthesize salinity measurements with other observations and numerical models, salinity science and applications have significantly advanced over recent years.

A semi-regular conference series focusing on ocean salinity observations and science has helped foster the rapidly growing applications of salinity data. The Ocean Salinity Conference series started in 2013 in Brest, France with a workshop mainly focused on the achievements of the two L-Band satellite missions measuring SSS from space at that time, namely, the Soil Moisture and Ocean Salinity (SMOS) Mission by the European Space Agency (ESA) and the Aquarius/SAC-D Mission by the National Aeronautics and Space Administration (NASA) and Argentine space agency CONAE. That workshop was followed by subsequent conferences in 2014, 2015, 2017 and 2018 in the UK (MetOffice), Germany (University of Hamburg), the US (Woods Hole Oceanographic Institution) and France (Paris Sorbonne University), respectively.

Following these meetings, the 2022 Ocean Salinity Conference (https://cpaess.ucar.edu/meetings/ocean-salinity-conference-2022) convened 6-9 June 2022 at Columbia University, New York, NY, USA. Despite significant challenges due to the evolving COVID-19 pandemic situation, the conference organizers and participants made their best efforts towards contributing to the success of the conference. The hybrid-format conference was attended by approximately 120 international researchers (with about 60 in-person and 60 virtual participants). The conference featured 53 early-career (including students and postdocs) presenters, which accounted for 48% of the conference presentations, a significant increase in the proportion of early-career presentations

compared to those in previous ocean salinity conferences. Early-career researchers also served as rapporteurs for two of the three breakout discussion sessions and reported the discussion summaries in the final plenary session.

The conference featured continuing efforts and new studies that increasingly push and widen the envelope for applications of salinity measurements, including topics with significant societal relevance, as well as studies of regions having significant challenges for the salinity observing system. The conference presentations and discussions resulted in a number of key recommendations related to enhancing the societal value of salinity measurements, continuing and improving the satellite and in-situ salinity observing systems, augmenting salinity field campaigns for process understanding and mission support, strengthening the utility of salinity measurements through modeling and assimilation, improving the understanding of salinity processes and salinity's roles in the Earth's climate system, as well as further improving satellite SSS retrievals (especially in high-latitude regions), the uncertainty estimations of satellite and in-situ salinity data (including representation errors), and multi-mission satellite SSS products.

The next Ocean Salinity Conference will be held in Europe sometime during the fall of 2023 or spring of 2024. A suggestion proposed potential coordination with the annual Argo science workshop (typically in the fall). Over the years, this conference series has brought together communities working on all aspects of ocean salinity research, including analyses based on in-situ and satellite observations, numerical models and data assimilation.

2. Organization

The goal of the 2022 conference was to review recent progress of on-going work and to identify the next challenges with regards to salinity science and technology.

There were 55 talks and 55 posters focusing on the following main topics:

(1) **Improvements and evaluation of satellite SSS products,** with an emphasis on satellite SSS retrievals, especially at high latitudes, multi-mission SSS products, comparisons with salinity observations from new in-situ technologies, and satellite/in-situ match-up and evaluation methods;

(2) **Process-based studies,** primarily focusing on near-surface vertical salinity stratification, barrier layer formation and maintenance, and rainfall effect, as measured with in-situ platforms, including innovative instruments;

(3) **Role of salinity in the global freshwater cycle and climate variability,** focusing on the impact of freshwater inputs on ocean circulation and decadal-to-centennial changes of evaporation, precipitation, SSS, and sea surface temperature (SST), as derived, for example, from long-term observations and model simulations;

(4) **Role of salinity in monitoring freshwater fluxes,** specifically: a) in river plume regions due to their interaction with large-scale circulation and extreme climatic events, b) at high latitudes due to their impact on sea ice, and c) as a statistical tool to diagnose changes in air-sea water fluxes and forecast precipitation over land;

(5) **Role of salinity in biogeochemistry,** focusing on the synergy of salinity with biogeochemical parameters, particularly oxygen and carbon, and how salinity can be combined with other parameters observable from space (SST, ocean color) to trace water masses, dilution effects and the carbonate system;

(6) **Role of salinity in ocean dynamics,** primarily focusing on the impact of assimilating satellite salinity observations into ocean forecasting models;

(7) **Challenges and requirements for future salinity observing systems** (remote sensing and in-situ platforms), focusing on new systems and strategies for measuring salinity from space and the state of the in-situ observing system.

3. Selected highlights of conference presentations

A major highlight of the conference was the large variety of scientific studies and operational applications presented, demonstrating the unprecedented accuracy and utility of currently available space-based salinity observations (SMOS, SMAP, and Aquarius) and in-situ observations. The presented studies emphasized how salinity observations are valuable to society, particularly in the context of stresses from climate variability and change.

Ocean salinity was shown to be an important driver of the climate system, spanning from the poles to the tropics. Field campaigns provided information on the vertical structure of the near-surface layer in terms of salinity and thermal stratification, highlighting the importance of salinity observations to improving our understanding and predictions of air-sea interaction, ocean vertical stratification, ocean heat content, and resulting climate patterns.

Satellite SSS observations covering the past 12 years provide invaluable information. Satellites can detect salinity anomalies linked to climate events, such as El Niño Southern Oscillation (ENSO) or the Indian Ocean Dipole (IOD), as well as anomalies linked to runoff and sea ice melt. Satellite salinity measurements have improved ocean reanalyses and ENSO forecasts and have potential for monitoring and predicting other components of the climate system. L-band measurements are also essential to measure high winds associated with storms.

Results presented at the conference underscored the importance of salinity and its redistribution to improving our understanding of water cycle changes expected from global warming. Sea surface salinity is a demonstrated skilled predictor for terrestrial precipitation at sub-seasonal time scales. SSS observations were also employed for

tracing river plumes and their potential impacts on the coastal oceans, including interaction with storms. Potential synergies with the Surface Water and Ocean Topography (SWOT) mission (planned launch in November 2022) were highlighted, especially freshwater transport at the land/ocean interface and by sub-mesoscale/mesoscale eddies.

A growing focus on high latitudes showed recent improvements for high-latitude satellite SSS retrievals, for both SMOS and SMAP, in the Arctic and Southern Oceans, along with the potential of salinity observations to monitor drastic changes affecting the high latitudes. The upcoming NASA salinity field campaign, Salinity And Stratification at the Sea Ice Edge (SASSIE), will provide more key surface in-situ measurements for evaluating and improving satellite salinity retrievals, as well as offering insights on the role of salinity and stratification in sea ice formation. A key result highlighted in the conference showed that salinity change induced by winds and sea-ice melt is important to sea-level rise in the Arctic's Beaufort Sea.

There is also an increasing number of studies using salinity as a proxy or input for biogeochemical parameters estimation. It has been shown, for example, that CO_2 fluxes can be reconstructed using SSS, SST and chlorophyll-a observations. With global warming, global ocean deoxygenation and acidification are expected and, in some North Atlantic regions, deoxygenation has been shown to be linked to salinity variations resulting from amplification of the water cycle (following the "fresh gets fresher, salty gets saltier" paradigm).

The studies presented highlight the full potential of salinity estimation, validation, and exploitation in current projects as contributions to initiatives such as the NASA Salinity Continuity Project and Ocean Salinity Science Team, the ESA SMOS Pilot Mission Exploitation Platform (Pi-MEP), and the ESA Climate Change Initiative SSS (CCI+SSS) project. New technologies, such as Saildrones, demonstrated utility for the validation of satellite SSS and SSS gradients.

Numerous efforts have been undertaken to characterize sub-footprint variability, the response of the upper ocean to tropical rainfall, and representation errors at various spatial (horizontal, vertical) and temporal scales within satellite validation exercises, including the use of suitable methods, such as the triple co-location method, to better estimate actual satellite uncertainties.

The conference highlighted new, multi-mission (SMOS, Aquarius, and SMAP) SSS products (NASA OISSS and ESA CCI SSS products), covering the period from 2010 onward, and their applications to study decadal changes during this period.

New concepts for future salinity missions were presented by NASA, ESA, and CNES. Specifically, these missions' concepts aim to a) ensure continuity of salinity measurements from space (ESA/Eumetsat/EC CIMR) and b) to improve satellite salinity observations via enhanced spatial resolution, and availability of measurements closer to

coast and to ice (CNES SMOS-HR) and via enhanced precision at high latitudes (CIMR+, the potential NASA contribution to CIMR).

Since the last Ocean Salinity Conference (Paris, 2018), two review articles were published to provide comprehensive reviews of the science accomplishments enabled by satellite SSS, as well as the way forward: "Satellite Salinity Observing System: Recent Discoveries and the Way Forward" (Vinogradova et al. 2019, Frontiers in Marine Science[1]) and "Sea surface salinity estimates from spaceborne L-band radiometers: An overview of the first decade of observation (2010–2019)" (Reul et al. 2020, Remote Sensing of Environment[2]). These articles highlight societal applications and end-users of satellite salinity observations, address integration and synergistic opportunities of salinity remote sensing within the global Earth observing system, and outline potential ways forward to continue and enhance the salinity satellite observing system in the upcoming decade.

To better promote salinity science and applications, the NASA salinity website (https://salinity.oceansciences.org/) provides StoryMaps (intended for a broader audience) and 1-page highlights that illustrate some recent accomplishments in the ocean salinity community.

4. Discussion and recommendations

Key issues and recommendations, including current limitations of the observing and modeling systems, were discussed during breakout discussion sessions on the last day of the conference. The following points were highlighted:

Recommendation #1: ***Maximizing the societal values of salinity measurements.***
It is particularly critical for the ocean salinity community to continue communicating and advocating the importance of salinity to Earth System science. The community needs to keep engaging with users, stake holders, and practitioners to better understand their needs and related societal issues and applications to help guide the ocean salinity community in improving the salinity observing system, along with enhancing science/applications supporting informed decision making. The societal value of salinity observation was demonstrated in the presentations, e.g., using salinity data to improve ENSO and terrestrial precipitation forecasts. In addition, the societal value of L-band measurements was shown through the capability of estimating high winds associated with

[1] Vinogradova N., Lee T., Boutin J., Drushka K., Fournier S., Sabia R., Stammer D., Bayler E., Reul N., Gordon A., Melnichenko O., Li L., Hackert E., Martin M., Kolodziejczyk N., Hasson A., Brown S., Misra S., and Lindstrom E. (2019) Satellite Salinity Observing System: Recent Discoveries and the Way Forward. *Frontiers in Marine Science, Frontiers Media, 2019, 6, pp.243. doi.org/10.3389/fmars.2019.00243*

[2] Reul N., Grodsky S.A., Arias M., Boutin J., Catany R., Chapron B., D'Amico F., Dinnat E., Donlon C., Fore A., Fournier S., Guimbard S., Hasson A., Kolodziejczyk N., Lagerloef G., Lee T., LeVine D., Lindstrom E., Maes C., Mecklenburg S., Meissner T., Olmedo E., Sabia R., Tenerelli J., Thouvenin-Masson C., Turiel A., Vergely J.L., Vinogradova N., Wentz F., and Yueh S. (2020) Sea Surface Salinity estimates from Spaceborne L-band radiometers: an overview of the first decade of observations (2010-2019). *Remote Sensing of Environment, Volume 242, 111769, doi.org/10.1016/j.rse.2020.111769*

hurricanes. A general knowledge gap, however, exists with regards to the physical processes underlying salinity's roles in forecasting across time scales, e.g., synoptic time scales for tropical cyclones, intra-seasonal time scales for Madden-Julian oscillation, and sub-seasonal-to-seasonal time scales for linking ocean salinity and terrestrial precipitation.

Recommendation #2: ***Continuity and enhancement of satellite SSS measurements.*** The ESA CIMR mission, with its planned launch in 2028, aims to provide continuity for satellite SSS observations, which is particularly relevant to climate research and operational activities, also leveraging on simultaneous measurements through its multi-frequency passive microwaves capabilities. The scientific and operational oceanographic community highlighted the need to enhance satellite SSS observation spatial resolution, increase the availability of measurements in coastal regions, and improve the accuracy of high-latitude satellite SSS observations. New technological research is ongoing at CNES and NASA to improve spatial resolution using new interferometry techniques (SMOS-HR) and measurement accuracy, especially at high latitudes, e.g. by using multi-frequency radiometry, including frequencies lower than the traditional 1.4 GHz (CIMR+).

Recommendation #3: ***Enhancement of in-situ salinity observing system.***
The conference also emphasized the essential role of in-situ salinity observations for: a) monitoring 3-D salinity and, correspondingly, the large-scale freshwater content of the ocean; b) measuring near-surface and upper-ocean stratification (including barrier layer formation and maintenance), which influences air-sea fluxes and control vertical mixing in the ocean; and c) validating satellite measurements and correcting their large-scale biases. The Argo program faces funding challenges that might compromise spatial/temporal coverage in the near future, especially given the need to add biogeochemical and deep ocean measurements, and to improve coverage in marginal seas and polar oceans. There were strong concerns expressed by conference participants that these initiatives could deplete the core Argo program, which is vital for validation of the satellite measurements. Initiatives should be taken by the ocean salinity community to create partnerships leveraging commercial companies, etc. As an example, a French cruise ship company was highlighted for agreeing to make in-situ measurements and launch Argo floats along their routes. Notably, there is no comprehensive salinity observing system in the Arctic Ocean; consequently, the community needs to engage with Arctic nations, as well as other potential sponsors, to include salinity observing capabilities in their Arctic Ocean observing system implementation plans. There is also a need for more skin surface measurements as they are essential to evaluate satellite salinity measurements. The tropical observing system, e.g. the TAO array in the Pacific, is another important set of observations that provide value in monitoring ocean circulation on a large scale. It has proved very useful in improving ENSO forecasts and has also been used extensively for validating satellite SSS especially because it provides a link from the days-to-weeks time scale available from satellite measurements to the minutes-to-years time scale measured by the buoys. While this observing system has undergone some recent rethinking and reconfiguration, the participants at the conference recommend the continuation of this system and support the efforts to renew and strengthen it.

Recommendation #4: ***Improving estimation of representation errors of salinity measurements.***
Presentations and discussions emphasized the requirement for better estimating the representation error of satellite and in-situ products, along with taking them into account when comparing in-situ versus satellite salinity measurements. Objective error estimates would be improved, as different sampling and smoothing of the measurements lead to significant spatio-temporal differences that need better characterization. A more-optimal in-situ/satellite "match-up" method for evaluating the uncertainties of satellite SSS on satellite footprints was presented. This activity is important for various on-going and future projects involving international collaboration, such as the ESA-NASA SMOS Pilot Mission Exploitation Platform (Pi-MEP) platform, the ESA Climate Change Initiative SSS ('CCI+SSS') project, NASA's Salinity Continuity Project and Ocean Salinity Science Team. Moreover, the triple co-location method provides one way to estimate representation errors by using three statistically independent salinity datasets.

Recommendation #5: ***Augmenting salinity field campaigns for process understanding and mission support.***
Past process studies such as SPURS-1 and SPURS-2 provided valuable information on the mechanisms responsible for near-surface salinity stratification. The NASA salinity field campaign SASSIE, planned for September 2022, will provide key measurements and insights on the role of salinity and stratification on the formation of sea ice, as well as the improvement of high-latitude salinity measurements from space. The conference emphasized the need for continuing process-oriented field campaigns, which also support future satellite missions like CIMR.

Recommendation #6: ***Strengthening the utility of salinity measurements through ocean modeling and data assimilation.***
Assimilating satellite salinity into Earth-system prediction models improves ENSO forecasts. Ongoing efforts aim to utilize salinity measurements in ocean state estimation and ocean forecast systems, as well as in climate model research. Enhancing collaborative efforts between the salinity-observing community and the modeling and data assimilation communities are important for maximizing the potential of the synergy between salinity measurements and other observations, as well as dynamical models.

Recommendation #7: ***Enhancing investigations of salinity's roles in the Earth climate system.***
Further exploration of the potential for salinity measurements to improve understanding Earth system science is needed, especially linkages between different elements of the Earth system, specifically including the water and carbon cycles. The conference highlighted emerging applications of salinity measurements to (1) improve the consistency of climate models and accuracy in estimating climate sensitivity, (2) study future changes in extreme ENSO events, and (3) investigate linkages between the global water and carbon cycles. The upcoming SWOT mission launch will significantly enhance research in land-sea linkages and will improve the estimation of sub-mesoscale SSS variations that cannot be resolved by satellite SSS in the foreseeable future. It will as well

enhance estimation of ocean heat content through constraining the assimilation of altimetry ocean observations with SSS.

Recommendation #8*: Improving understanding of surface-layer dynamics associated with salinity.*
Improved understanding of the advection and mixing of fresh pools from river plumes, melting sea ice, etc. is needed, as it will help improving transport forecasts for pollutants, sargassum and surface plastic debris, etc. More observations are required, along with better understanding of the near-surface wind/wave-driven flow field.

Recommendation #9*: Improving dielectric constant model.*
The need for further improving the accuracy of the dielectric constant models used to retrieve SSS from space was underscored, as it would lead to better SSS retrievals, especially in cold waters, as well as help disentangle possible remaining correlated flaws between the various components of direct forward models (dielectric constant, sea surface roughness, diffusion of galactic signal, etc..).

5. Further community activities relevant to salinity remote sensing

The conference enabled further discussions about potential partnership between ESA and NASA to enhance future satellite missions, such as CIMR, as well as opened the door for future dialogue on a potential partnership between CNES and NASA on the SMOS-HR satellite concept.

The conference also facilitated discussions about a potential additional partnership between ESA and NASA, under the ESA Climate Change Initiative CCI+SSS (http://cci.esa.int/salinity), to produce and distribute merged NASA-ESA satellite salinity products covering the entire satellite records of the SMOS, Aquarius and SMAP missions.

The conference featured a detailed update and presentation on the ESA-funded implementation of the Pilot-Mission Exploitation Platform for Salinity (SMOS Pi-MEP, https://pimep.oceandatalab.com), an ongoing partnership with NASA. The platform aims to further focus the salinity community by providing a tool for extended validation of salinity data. Additionally, PiMEP aims to support users performing scientific process studies that use a variety of oceanographic data (satellite, in-situ, model and thematic datasets) with collocated tools for one-stop efficiency. PiMEP also contains an updated match-up database between satellite and in-situ salinity products and provides validation reports. Ongoing and upcoming ESA-NASA PI-MEP efforts will focus on triple-collocation analyses and representation errors characterization. The platform has been operational since 2019 and is constantly updated.

6. Acknowledgement

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7. Conference presentations

Oral and poster presentations presented at the conference will be available through the NASA ocean salinity website (https://salinity.oceansciences.org/) unless the authors requested not to disseminate their presentations. The conference program is provided in the Annex.

8. Annex: Program of the 2022 Ocean Salinity Conference

* indicates invited talks
(v) indicates virtual (Zoom) talk

Please find the Zoom link for the oral sessions and the link for virtual poster session later in this document.

Day 1, 6 June 2022

08:00-08:50	Registration check-in	
8:00 – 8:50	Morning refreshment on the 2nd floor	
08:50-09:00	Welcome and logistics	
09:00-10:40	Oral presentations (Chair: Tony Lee)	
09:00-09:20	Nadya Vinogradova-Shiffer NASA Headquarters	*Overview of NASA Ocean Salinity Science Team activities
09:20-09:40	Roberto Sabia European Space Agency - ESRIN, Frascati, Italy	*Overview of ESA salinity science/technology
09:40-10:00	Susan Wijffels Woods Hole Oceanographic Institution	*Tracking global ocean salinity through in-situ observations: achievements and challenges
10:00-10:20	Arnold Gordon Lamont-Doherty Earth Observatory of Columbia University	*Changing surface layer salinity, and where it matters most
10:20-10:40	Janet Sprintall Scripps Institution of Oceanography, University of California, San Diego	*Salinity Stratified Barrier Layers in the Upper Ocean
10:40-11:00	Break	
10:30 – 11:30	Light refreshments on the 2nd floor	
11:00-12:30	Oral presentations (Chair: Tony Lee)	
11:00-11:20	Jérôme Vialard Institut de Recherche pour le Développement (IRD)	(v)*The Bay of Bengal as a natural laboratory to study salinity variability and its impacts
11:20-11:40	Severine Fournier Jet Propulsion Lab	*Ocean salinity, a key parameter to study land-sea linkages and river plumes

11:40-11:55	Manon Gévaudan LEGOS, Toulouse, France	(v) Influence of the Amazon-Orinoco discharge interannual variability on the western tropical Atlantic
11:55-12:10	Gael Alory LEGOS, France	Coastal Upwelling Limitation by Onshore Geostrophic Flow in the Gulf of Guinea around the Niger River Plume
12:10-12:25	Shota Katsura, Scripps Institution of Oceanography, University of California, San Diego	Barrier Layers and Temperature Inversions in the Eastern Pacific Fresh Pool and Their Impact on the Heat and Freshwater Balance
12:25-14:00	Lunch on your own	
14:00 – 15:00	Light refreshments on the 2nd floor	
14:00-15:00	Oral presentations (Chair: Jacqueline Boutin)	
14:00-14:15	Elizabeth Thompson NOAA Physical Sciences Lab	(v) Bridging satellite and in-situ scales of rain-induced near-surface salinity stratification
15:15-14:30	Lisa Gassen Institute for Chemistry and Biology of the Marine Environment (ICBM), Carl von Ossietzky University of Oldenburg, Wilhelmshaven, Germany	(v, pre-recorded video) The effect of rain on the sea surface
14:30-14:45	Suneil Iyer University of Washington Applied Physics Laboratory and School of Oceanography	The influence of preexisting stratification and tropical rain modes on the mixed layer salinity response to rainfall
14:45-15:00	Estrella Olmedo Insittute of Marine Sciences (CSIC-BEC)	(v) Evidence of large areas of stratified waters in the SMOS Sea Surface Salinity maps
15:00-16:30	Poster session 1	
16:30-17:30	Oral presentations (Chair: Jacqueline Boutin)	
16:30-16:45	Frederick Bingham University of North Carolina Wilmington, Center for Marine Science	Seasonal and Interannual Variability of the South Indian Ocean Sea Surface Salinity Maximum
16:45-17:00	Ebenezer Nyadjro, Mississippi State University	(v) Impacts of the 2019 strong IOD and monsoon events on Indian Ocean sea surface salinity
17:00-17:20 (AEST 7am)	Jan Zika University of New South Wales, Sydney (to be presented by Taimoor Sohail)	(v)*The geographical pattern of water cycle change evident from changes in ocean water masses

17:20-17:30	Buffer
17:30-19:30	Social and networking event on the 4th floor

Day 2, 7 June 2022

8:00 – 9:00	Morning refreshment on the 2nd floor	
09:00-10:40	Oral presentations (Chair: Severine Fournier)	
09:00-09:20	Lisan Yu Woods Hole Oceanographic Institution	*Increase of the Atlantic-Pacific Salinity Contrast as the Ocean Water Cycle Intensifies
09:20-09:35	Estrella Olmedo Insittute of Marine Sciences (CSIC-BEC)	SO FRESH: The relevance of satellite SSS for study of freshwater fluxes in the Southern Ocean
09:35-09:55	Ray Schmitt Woods Hole Oceanographic Institution and Salient Predictions, Inc.	(v) *Predicting Terrestrial Precipitation with Ocean Salinity
09:55-10:10	Laifang Li Pennsylvania State University	Skillful long-lead prediction of summertime heavy rainfall in the US Midwest from sea surface salinity
10:10-10:25	Nicolas Reul IFREMER	(v) Surface Salinity interactions with Storms
10:25-10:40	Lauren Hoffman Scripps Institution of Oceanography	Ocean Surface Salinity Response to Atmospheric River Precipitation in the California Current System
10:40-11:00	Break	
10:30 – 11:30	Light refreshments on the 2nd floor	
11:00-12:30	Oral presentations (Chair: Severine Fournier)	
11:00-11:20	Christophe Maes IRD-LOPS	(v) River freshwater fluxes and mesoscale dynamics in the South East Asia region
11:20-11:35	Gilles Reverdin LOCEAN	(v) Sea water isotopes, salinity and the freshwater cycle, lessons from a LOCEAN database
11:35-11:50	Aqeel Piracha ICM-CSIC	(v) A material approach to the traditional water mass transformation framework
11:50-12:05	Léa Olivier LOCEAN-IPSL, Sorbonne Université-CNRS-IRD-MNHN, Paris, France	(v, pre-recorded video) Impact of North Brazil Current rings on surface salinity and air-sea CO2 fluxes variability in winter 2020 in the north-western tropical Atlantic

12:05-12:20	Cristina González-Haro Institute of Marine Sciences, CSIC and Barcelona Expert Center	(v) SMOS derived Colored Detrital Matter product in the Black Sea
12:20-12:30	Buffer	
12:30-14:00	Lunch on your own	
14:00-15:00	Light refreshments on the 2nd floor	
14:00-15:35	Oral presentations (Chair: Fred Bingham)	
14:00-14:20	Eric Hackert NASA/GMAO	(v) *Effect of rain-adjusted Aquarius and SMAP satellite sea surface salinity on ENSO Predictions from the GMAO S2S Forecast System
14:20-14:35	Maya Chung Atmospheric and Oceanic Sciences Program, Princeton University, Princeton, NJ	The role of sea surface salinity in extreme El Niño events
14:35-14:50	Maofeng Liu Rosenstiel School of Marine and Atmospheric Science, University of Miami	(v) The spread of ocean heat uptake efficiency in CMIP6 models traced to ocean salinity
14:50-15:05	Allison Hogikyan Princeton University Atmospheric and Oceanic Sciences Program	Coupling of global water and carbon cycles
15:05-15:20	Subrahmanyam Bulusu School of the Earth, Ocean and Environment, University of South Carolina	Identifying Tidally-generated Internal Waves in Salinity in the Bay of Bengal
15:20-16:00	Discussion	
16:00-17:30	Poster session 2	

Day 3, 8 June 2022

08:00-09:00	Morning refreshment on the 2nd floor
09:00-10:40	Oral presentations (Chair: Subra Busulu)

09:00-09:15	David Le Vine Goddard Space Flight Center	(v) Models for the Dielectric Constant of Sea Water for Remote Sensing of Salinity: A Perspective
09:15-09:30	Thomas Meissner Remote Sensing Systems	The NASA/RSS SMAP Salinity Version 5 Release
09:30-09:50	Jacqueline Boutin LOCEAN-IPSL/CNRS	*Satellite-based Time-Series of Sea Surface Salinity designed for Ocean and Climate Studies: SMOS and CCI SSS
09:50-10:05	Julian Schanze Earth and Space Research, Seattle, WA, USA	Matching up Satellite and In-Situ Measurements of Surface Salinity: Challenges and Solutions
10:05-10:25	Sebastien Guimbard OceanScope	(v)*Multi-mission satellite salinity evaluation and exploitation platform
10:25-10:40	Nina Hoareau Institute of Marine Science (ICM-CSIC) Barcelona, Spain	(v, pre-recorded video) Sea surface salinity variability and error maps of satellite observations in the Inter Tropical Convergence Zone
10:30 – 11:30	Light refreshments on the 2nd floor	
10:40-11:00	Break	
11:00-12:30	Oral presentations (Chair: Fred Bingham)	
11:00-11:20	Kyla Drushka Applied Physics Laboratory, University of Washington	*Arctic salinity processes and NASA's upcoming SASSIE experiment
11:20-11:35	Carolina Gabarro Institute of Marine Science & BEC CSIC	(v) Satellite salinity to monitor the freshwater fluxes in the Arctic Ocean
11:35-11:50	Marta Umbert ICM-CSIC	(v) Using remotely observed SSS and colored detrital matter to characterize freshened surface layers in the Kara and Laptev seas during the ice-free season
11:50-12:05	Alexandre Supply University of Brest, LOPS Laboratory, IUEM, UBO–CNRS–IRD–Ifremer, Plouzané, France /// CNES, Paris, France	Surface salinity drawdown observed with satellite L-Band radiometers when sea ice melts
12:05-12:30	Discussion	
12:30-14:00	Lunch on your own	
14:00-15:00	Light refreshments on the 2nd floor	

14:00-15:30	Oral presentations (Chair: Gael Alory)	
14:00-14:15	Ichiro Fukumori Jet Propulsion Laboratory, California Institute of Technology	(v) Causal Mechanism of Freshwater Content Change in the Beaufort Sea
14:15-14:30	Scott Durski Oregon State University, College of Earth, Ocean and Atmospheric Sciences	Salinity Variability influenced by shelf-interior ocean interactions in the Northeast Pacific and Bering Sea
14:30-14:45	Jorge Vazquez, Jet Propulsion Laboratory/California Institute of Technology	Using Saildrones to Validate Arctic Sea-Surface Salinity from the SMAP Satellite: A use case applied to the Y-K Delta
14:45-15:00	Sarah Hall School of the Earth, Ocean and Environment, University of South Carolina, Columbia, SC 29208, USA.	Comparison of Surface and Subsurface Salinity within the Arctic and Beaufort Gyre using in-situ, satellite and model simulations
15:00-15:15	Oleg Melnichenko International Pacific Research Center, School of Ocean and Earth Science and Technology, University of Hawaii, Honolulu, Hawaii	Aquarius/SMAP OISSS: Global Patterns of SSS Variability from Ten Years of Satellite Data
15:15-15:30	Daling Li Yi International Pacific Research Center, University of Hawai'i	(v) Time and length scales of sea surface salinity variability from satellite observations and high-resolution thermosalinograph data
15:30-16:00	Discussion	
16:00-17:30	Poster session 3	

Day 4, 9 June 2022

08:00-09:00	Morning refreshment on the 3rd floor
09:00-10:40	Oral presentations (Chair: Tony Lee)

09:00- 09:20	Eric Bayler NOAA/NESDIS/Center for Satellite Applications & Research (STAR)	*Exploitation of Satellite Sea-surface Salinity Observations at NOAA
09:20- 09:35	Pingping Xie NOAA/NWS/NCEP Climate Prediction Center	Operational Monitoring of the Global Sea-Surface Salinity and Fresh Water Flux with In-situ and Satellite Observations
09:35- 09:50	Elisabeth Remy Mercator Ocean	Ocean surface salinity estimation in Mercator Ocean global analysis: accuracy and plan for future improvements
09:50- 10:05	Lee-Lueng Fu Jet Propulsion Laboratory, California Institute of Technology	Potential applications of the SWOT mission to salinity science and applications
10:05- 10:20	Nemesio Rodriguez-Fernandez CESBIO	(v) Enhanced spatial resolution of satellite salinity measurements: the SMOS High-resolution mission
10:20- 10:40	Shannon Brown Jet Propulsion Laboratory	*SMOS, Aquarius, SMAP... What's Next?
10:30 – 11:30	Light refreshments on the 3rd floor	
10:40- 11:00	Break	
11:00- 12:30	Discussion and closing	

Posters

Including in-person posters and virtual posters.
Virtual posters can be viewed in
https://app.virtualpostersession.org/e/a87d92565d1736c36c5de10e27180365
Some virtual poster presenters also indicated specific times for Chat with presenters via Zoom.

Santha Akella NASA GSFC	Modeling near-surface SST and SSS variability for Data Assimilation and improved Seasonal Predictions
Jesse Anderson Earth & Space Research	Triple collocation analysis for evaluation of satellite salinity
Gael Alory LEGOS, France	The French Sea Surface Salinity Observation Service : 50 Years of Global Observations from Ships of Opportunity
Giuseppe Aulicino Università degli Studi di Napoli Parthenope, Italy	Sea Surface Salinity and Temperature in the Pacific sector of the Southern Ocean during the last two decades

Dhruba Banerjee, Swami VIvekananda Institute of Science and Technology, Kolkata, India	The scenario of Sea surface salinity, Cyclone and the mangrove barrier of Sundarban and the costal part of Bay of Bengal in North India Ocean in last decades
Eric Bayler NOAA/NESDIS/Center for Satellite Applications & Research (STAR)	Satellite Sea-surface Density
Jacqueline Boutin LOCEAN-IPSL/CNRS	SMOS salinity retrieved from new seawater dielectric constant models at L-band
James Boyle Western Connecticut State University	Comparison of in-situ measured near-surface salinity and temperature with satellite-derived data products during three North Atlantic Ocean partial transits on vessels of opportunity
Jessica Caughtry ESA	Temporal evolution and scaling properties of Water Mass formation from space
Nan-Hsun Chi Independent Researcher	Joint Analysis of Spatio-Temporal Variability of Salinity and Precipitation in the Eastern Pacific Fresh Pool
Oksana Chkrebtii The Ohio State University	Detecting rainfall from sea surface salinity in the eastern tropical Pacific
Rinku Das Assistant Teacher, Baruipur Girls High School, South 24 Parganas, West Bengal , India	The effect of tidal influence on the surface water salinity profile which is a potential indicator of climate change in Sagar Island : An important part of Indian Sundarban area
Annette deCharon, ODYSEA LLC	What's New on the "NASA Salinity" Website
Alina Dossa UFPE, Brazil & LEGOS, France	Global Analysis of Coastal Gradients of Sea Surface Salinity
Severine Fournier Jet Propulsion Lab	Quantification of Aquarius, SMAP, SMOS and Argo-based gridded sea surface salinity products sampling errors
Aina García Institut de Ciències del Mar, CSIC, Barcelona, Spain	On the optimal data processing of the Soil Moisture and Ocean Salinity measurements
Verónica González-Gambau Barcelona Expert Center & Institute of Marine Sciences, CSIC	Oceanographic added-value of the first regional SMOS Sea Surface Salinity products over the Baltic Sea
Cristina González-Haro Institute of Marine Sciences, CSIC. and Barcelona Expert Center	Exploring synergies between remote sensing products developed under the framework of ESA Baltic+ initiative: Sea Surface Salinity and Sea Level
Virendra Goswami Indian Institute of Technology (IIT) & Environment and Peace Foundation	Physicochemical and spectroscopic methods for Remediation of Water Pollution by Catalytic Oxidants & Development of Climate and Ocean Forecasts Models (COFM).
Semyon Grodsky University of Maryland	Eastward surface salinity features in the Atlantic

Odilon Joël Houndegnonto University of Brest, IRD, CNRS, Ifremer, Laboratoire d'Océanographie Physique et Spatiale (LOPS, UMR 6523), Brest, France	On the formation of thermohaline stratification off Congo River plume
Maria Jacob Central Florida Remote Sensing Lab - University of Central Florida	First Results of the Parametrized Rain Impact Model (PRIM)
Yibo Jiang Jet Propulsion Lab	PODAAC Cloud Support for the NASA Satellite and In-situ Oceanographic Data
Hsun-Ying Kao Earth & Space Research	Validation for SMAP RSS V5.0 Salinity and Salinity Fronts
Yoonji Kim Department of Statistics, The Ohio State University	Comparison of Sea Surface Salinity and Freshwater Forcing accounting for Phase Variability
Nicolas Kolodziejczyk University of Brest, LOPS Laboratory	Variability of the Polar Front in the Barents Sea from L-Band radiometers measurements
Alexander Kurapov NOAA Coast Survey Development Laboratory (NOAA/NOS/OCS/CSDL)	Sea surface salinity (SSS) variability in the offshore waters along the US and Canadian West Coasts
Julia Levin Rutgers University	Modeling study of surface salinity anomalies in the Gulf of Maine using backward dye release experiments.
Xinfeng Liang University of Delaware	Interannual Variability of the Mediterranean Overflow Water from 2005 to 2016
Chao Liu University of Delaware	Variability and Changes in Ocean Salinity from Multiple Objective Analysis Products During the Argo Period
Maofeng Liu Rosenstiel School of Marine and Atmospheric Science, University of Miami	The linkages between the hydrological cycle, ocean salinity and transient climate change
Christophe Maes IRD-LOPS	River freshwater fluxes and mesoscale dynamics in the South East Asia region
Andrew Manaster Remote Sensing Systems	SMAP Salinity Retrievals Near the Sea-Ice Edge Using Multi-Spectral Information from AMSR2
Andrew Manaster Remote Sensing Systems	RSS Salinity Continuity Processing System
Marie Montero LOPS (IFREMER/CNRS/IRD/UBO), Brest, France	Towards long-term (2002-present) reconstruction of northern Indian Ocean Sea Surface Salinity based on AMSR-E and L-band Radiometer data

Xunwei Nie First Institute of Oceanography, Ministry of Natural Resources	Decadal Variability in Salinity of the Indian Ocean Subtropical Underwater During the Argo Period
Estrella Olmedo Insittute of Marine Sciences (CSIC-BEC)	Ten years of dedicated SMOS Sea Surface Salinity maps in the Black Sea
Xavier Perrot LOCEAN	Sea surface salinity signature of an Agulhas ring from satellite data.
Katrin Schroeder CNR-ISMAR, Venezia, Italy	Long term thermohaline changes at depth: examples from two Mediterranean Channels
Taimoor Sohail School of Mathematics and Statistics, University of New South Wales, Sydney, Australia	Amplification of historical poleward freshwater transport underestimated by climate reconstructions
Alexander Soloviev Physical Oceanography Laboratory, Nova Southeastern University, Dania Beach, FL 33004, USA	Remote Sensing, In-Situ Observations, and High-Resolution Modeling of Low-Salinity Lenses in the Presence of Oil Slicks
Richard Justin Small National Center for Atmospheric Research	The Role of Salinity in the Subantarctic Mode Water Formation and Variability
Jingru Sun Princeton University	Influence of vertical wind shear on the ocean response to tropical cyclones
Alexandre Supply University of Brest, LOPS Laboratory, IUEM, UBO–CNRS–IRD–Ifremer, Plouzané, France and CNES, Paris, France	Sea ice variability and stratification over the Arctic Ocean
R Dwi Susanto University of Maryland	Land-sea linkage of peatland soils moisture and salinity in the Indonesian seas
Simon Yueh Jet Propulsion Laboratory	An Empirical Algorithm for Mitigating the Sea Ice Effect in SMAP Radiometer for Sea Surface Salinity Retrieval in the Arctic Seas
Clovis Thouvenin-Masson LOCEAN-IPSL, CNES, ACRI-ST	Salinity variability in satellite subpixels: toward an interpretation of SMOS – Argo residuals.
Sandra Tippenhauer Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Am Handelshafen 12 27570 Bremerhaven, Germany	High-precision calibration of salinity measurements
David Trossman Louisiana State University, DOCS and CCT	(Revised title) An Algorithm to Bias-Correct and Transform Arctic Satellite-Derived Skin Salinities into Bulk Surface Salinities

Vardis Tsontos NASA Jet Propulsion Laboratory, California Institute of Technology	Web-based Tools and Services for Integrated Support of NASA Satellite Salinity and Field Campaigns
Antonio Turiel Institute of Marine Sciences, CSIC/Barcelona Expert Center	SO FRESH: The relevance of satellite SSS for the study of freshwater fluxes in the Southern Ocean
Marta Umbert Institute of Marine Sciences (ICM-CSIC), Barcelona, Spain	The contribution of the Vendée Globe Race to improved ocean surface information. A validation of the remotely sensed salinity in the sub-Antarctic zone
Cristofer Vargas Chaffey College, 5885 Haven Ave, Rancho Cucamonga, CA, 91737	Spatial Distributions of Ocean Salinity Along the Indian Coasts Using Satellite and In-situ data.
Zhankun Wang Northern Gulf Institute, Mississippi State University; NOAA's National Centers for Environmental Information	NCEI Surface Underway Marine Database (SUMD) Initiative
Oliver Wurl University of Oldenburg, Insitute of Chemistry and Biology of the Marine Environment	The North Sea from space: Using explainable artificial intelligence to improve satellite observations of salinity and temperature