The University of Oklahoma (OU)
Department of Meteorology and Computer Science
marina.vicensmiquel@ou.edu

#### **EDUCATION**

Present

Ph.D. Texas A&M University–Corpus Christi, May 2024

Geospatial Computer Science Ph.D. GPA: 3.93

B.S. Texas A&M University–Corpus Christi, May 2020

Double Major: Computer Science, Mathematics

Magna Cum Laude GPA: 3.85

#### RESEARCH EXPERIENCE

August 2024 Postdoctoral Research Associate in Meteorology and Computer Science at The University of Oklahoma

Principal Researchers: Drs. A. McGovern and A. Hill (OU and AI2ES)

<u>Deep Learning, Uncertainty Quantification, and Explainability for Extreme</u>

Precipitation Predictions

• Developing innovative machine learning methods to enhance the accuracy, uncertainty quantification, and explainability of extreme precipitation predictions, advancing the state-of-the-art in weather forecasting and climate science.

May 2024 Research Program Associate II at the NSF AI Institute for Research on
Trustworthy AI in Weather, Climate, and Coastal Oceanography
July 2024 (AI2ES) and Conrad Blucher Institute at TAMUCC

Principal Researcher: Dr. P. Tissot (TAMU-CC and AI2ES)

Deep Learning for Coastal Inundation Predictions

• Expanding research from Ph.D. work on AI operational real-time coastal inundation models.

Fall 2020

— Graduate Research Assistant at the NSF AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography (AI2ES) and Conrad Blucher Institute at TAMUCC

Principal Researchers: Drs. P. Tissot & A. Medrano (TAMU-CC and AI2ES; Co-Advisors)

Deep Learning for Coastal Inundation Predictions

- Development of an AI operational real-time coastal inundation model for Horace Caldwell Pier, Port Aransas, TX.
- Working collaboratively with Nueces County and local National Weather Service office, who will use the real-time predictions.

#### Deep Learning to Predict Cold-Stunning Events in Southern Texas

• Development of an AI operational real-time model to improve stakeholder decision-making concerning sea turtle and fisheries conservation efforts during freeze events along the Texas coast.

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#### <u>Analysis of Sandy Beach Morphology Changes from a High Spatiotemporal</u> Resolution Dataset

- Analysis of the beach morphology changes.
- Working collaboratively with the city of Port Aransas, who will use this information to implement the necessary conservation measures.

#### Comparison of Deep Learning Methods for Coastal Water Level Predictions

- Development and DL operation real-time model to predict water level at multiple locations along the Texas coast to be used as inputs for a coastal inundation real-time model.
- Performance comparison of multiple DL architectures from MLP, to Seq2Seq, to multiple Transformer architectures.

# A 10-Year Metocean Dataset for Laguna Madre, Texas Including for the Study of Extreme Cold Events

- Creation of a newly imputed 10-year metocean dataset representative of the Laguna Madre and development of publicly available repository applicable for AI implementation by wideaudiences.
- Applied to the Cold-Stunning model used for sufficient sea turtle recovery efforts.

# <u>Implementation of a Zed 2i Stereo Camera for High-Frequency Shoreline Change and Coastal Elevation Monitoring</u>

- Creation and georeferencing of DEM products from stereo imagery to monitor coastal inundation.
- Accuracy comparison between UAS and photogrammetry methods for DEM products.

# A Deep Learning Based Method to Delineate the Wet/Dry Shoreline and Compute Its Elevation Using High-Resolution UAS Imagery

- Development of a modified edge detection architecture to detect the wet/dry shoreline using UAS imagery and extract the elevation by superimposing the imagery on the top of DEM.
- Used as the ground truth of the position of the wet/dry shoreline to predict inundation events.

### Summer 2023 Research Collaborator at the University of Valencia, Spain

<u>Towards Resilient Coastal Management: Supervised Learning for Seasonal to Multi-Year Water Level Predictions in Texas Gulf Coast</u>

Principal Researcher: Dr. V. Nieves (University of Valencia)

• Implementation of an AI operational real-time sub-seasonal to multiyear water level model for the entire Texas Gulf Coast.

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• Predictions will be used by authorities to implement necessary measures to mitigate flood effects.

# Spring 2020 Research Intern at Lone Star UAS Center (LSUASC) Research in UAV Damage Assessment using Deep Learning

Principal Researcher: J. Boyd (LSUASC)

• Use of computer vision approach to detect and quantify damage assessment of buildings after various natural disasters.

#### JOURNAL PUBLICATIONS

- Vicens-Miquel, M.; Radin, C.; Nieves, V.; Tissot, P. Towards Resilient Coastal Management: Supervised Learning for Seasonal to Multi-Year Water Level Predictions in Texas Gulf Coast. Ocean & Coastal Management. (Under Review).
- Vicens-Miquel, M.; Tissot, P. E.; Colburn, K. F. A.; Williams, D. D.; Starek, M. J.; Pilartes-Congo, J.; Kastl, M.; Stephenson, S.; Medrano, F. A. *Machine-Learning Predictions for Total Water Level on a Sandy Beach*. Journal of Coastal Research, 41(1), 57-72. DOI: 10.2112/JCOASTRES-D-24-00016.1.
- Vicens-Miquel, M.; Tissot, P.; Medrano, F. A. Exploring Deep Learning Methods for Short-Term Tide Gauge Water Level Predictions. Water. 16(20), 2886. DOI: 10.3390/w16202886.
- Vicens-Miquel, M.; Tissot, P. E.; Williams, D. D.; Coburn, K. F. A.; Kastl, M.; Stephenson, S. *A High-Resolution Spatiotemporal Morphological Dataset: Port Aransas Beach, Texas.* Data in Brief, 57, 110948. DOI: 10.1016/j.dib.2024.110948.
- Radin, C.; Nieves, V.; **Vicens-Miquel, M.**; Alvarez-Morales, J. L. *Harnessing ML to Decode the Mediterranean's Climate Canvas and Forecast Sea Level Changes*. Climate, 12(8), 127. DOI: 10.3390/cli12080127.
- Vicens-Miquel, M.; Williams, D. D.; Tissot, P. E. Analysis of Sandy Beach Morphology Changes and Inundation Events from a High Spatial Temporal Resolution Dataset. Journal of Coastal Research, 40(6), 1001-1018. DOI: 10.2112/JCOASTRES-D-24-00007.1.
- White, M.; Vicens-Miquel, M.; Tissot, P.; Krell, E. A 10-Year Metocean Dataset for Laguna Madre, Texas Including for the Study of Extreme Cold Events. Data in Brief. DOI: 10.1016/j.dib.2023.109828.

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Vicens-Miquel, M.; Medrano, A.; Tissot, P.; Kamangir, H.; Starek, M. *A Deep Learning Based Method to Delineate the Wet/Dry Shoreline and Compute its Elevation Using High-Resolution UAS Imagery.* Remote Sensing MDPI. 14(23), 5990. DOI: 10.3390/rs14235990.

#### **CONFERENCE PROCEEDINGS (Peer Reviewed)**

- Pilartes-Congo, J.; Kastl, M.; Starek, M.; Vicens-Miquel, M.; Tissot, P. *Implementation of a Zed 2i Stereo Camera for High-Frequency Shoreline Change and Coastal Elevation Monitoring.* International Geoscience and Remote Sensing Symposium (IGARSS), Pasadena, CA, USA, July 16-21. DOI: 10.1109/IGARSS52108.2023.10283203.
- Vicens-Miquel, M.; Medrano, A.; Tissot, P.; Kamangir, H.; Starek, M. Deep Learning Automatic Detection of the Wet/Dry Shoreline at Fish Pass, Texas. 2022 International Geoscience and Remote Sensing Symposium (IGARSS), Kuala Lumpur, Malaysia, 17-22, 2022. DOI: 10.1109/IGARSS46834.2022.9884633.
- Rahnemoonfar, M.; Robin, M.; Vicens-Miquel, M.; Dobbs, D.; Adams, A. Flooded Area Detection from UAV Images Based on Densely Connected Recurrent Neural Networks. International Geoscience and Remote Sensing Symposium (IGARSS), Valencia, Spain, July 22-27. DOI: 10.1109/IGARSS.2018.8517946.

#### CONFERENCE PRESENTATIONS AND INVITED TALKS

- Vicens-Miquel, M.; Tissot, P. E.; Colburn, K. F. A.; Williams, D. D.; Starek, M. J.; Pilartes-Congo, J.; Kastl, M.; Stephenson, S.; Medrano, F. A. Total Water Level Predictions for a Sandy Beach: Camera-Based Measurements and an Operational Machine-Learning Model. Oral presentation at the American Meteorological Society Annual Meeting, New Orleans, LA, USA, January 12-16.
- Estrada, B.; Tissot, P.; **Vicens-Miquel, M.** *Machine Learning Based Water Level Predictions for Southern Florida*. Poster presentation at the American Meteorological Society Annual Meeting, New Orleans, LA, USA, January 12-16.
- Alonzo, J.; Tissot, P.; Beasley, A.; Vicens-Miquel, M.; Shelly, R. J.; Tissot, F. Deployment of Lower Cost Water Level Sensors and Machine Learning Models for Local Coastal Inundation Monitoring and Predictions. Oral presentation at the American Meteorological Society Annual Meeting, New Orleans, LA, USA, January 12-16.

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- Fuentes, F.; Tissot, P.; Vicens-Miquel, M. Machine Learning Inland Compound Flooding Predictions for Corpus Christi, Texas. Oral presentation at the American Meteorological Society Annual Meeting, New Orleans, LA, USA, January 12-16.
- Tissot, P.; Alonzo, J.; Shelly, R. J.; Beasley, A.; Vicens-Miquel, M. Machine Learning and Lower Cost Water Level Sensors for Coastal Inundation Monitoring and Predictions. Oral presentation at the Costal Resilience & Adaptation Conference, Virtual, September 18-19.
- Vicens-Miquel, M.; Tissot, P.; Medrano, A. Performance and comparison of Seq2Seq and Transformer Model Architectures for the Prediction of Water Levels from Hours to Days. Oral presentation at the American Meteorological Society Annual Meeting, Baltimore, MD, USA, January 28-February 1.
- Vicens-Miquel, M.; Radin, C.; Nieves, V.; Tissot, P.; Medrano, A. Empowering Coastal Resilience: A Multi-Layer Perceptron Approach for Subseasonal-to-Seasonal Sea Level Predictions in the Gulf of Mexico. Poster presentation at the American Meteorological Society Annual Meeting, Baltimore, MD, USA, January 28-February 1.
- White, M.; Vicens-Miquel, M.; Marrero, H.; Tissot, P.; Woodall, C.; Duff, C.; Colburn B. *Uncertainty Quantification of the Onset and Offset of Cold-Stunning Events Using AI Ensemble Methods*. Poster presentation at the American Meteorological Society Annual Meeting, Baltimore, MD, USA, January 28-February 1.
- Colburn, K.; Vicens-Miquel, M.; Tissot, P. The Use of Oblique Imagery and Ground Elevation Surveys to Generate a Time Serios of Wet/Dry Shoreline Elevations. Poster presentation at the American Meteorological Society Annual Meeting, Baltimore, MD, USA, January 28-February 1.
- Ehrke, C.; Tissot, P.; Vicens-Miquel, M.; Estrada, B.; Mukai, K.; Glazer, B. Estimation of Wave Height from Standard Deviation of Water Level Measured by a Low-Cost Water Level Sensor. Poster presentation at the American Meteorological Society Annual Meeting, Baltimore, MD, USA, January 28-February 1.
- Woodall, J.; White, M.; Marrero, H.; Vicens-Miquel, M.; Tissot, P. Exploring Cross-Validation Techniques for ML Predictions of Rare Cold-Stunning Events. Poster presentation at the American Meteorological Society Annual Meeting, Baltimore, MD, USA, January 28-February 1.

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- Vicens-Miquel, M.; Radin, C.; Nieves, V.; Tissot, P.; Medrano, A. Advancing Coastal Inundation Frequency Predictions with an AI-based Sub-seasonal to Multi-year Water Level Model in the Gulf of Mexico. Poster presentation at the AGU Fall Meeting 2023, San Francisco, CA, USA, December 11-15.
- Vicens-Miquel, M.; Tissot, P.; Medrano, A. Deep Learning Architectures for Short-Term Water Level Predictions. Oral presentation at the 2023 ASBPA National Coastal Conference, Provide, RI, USA, October 10-13.
- Tissot, P.; White, M.; Vicens-Miquel, M.; Kamangir, H.; Krell, E.; Kastl, M.; Estrada, B.; Colburn, K.; Stephenson, S.; Alonzo, J.; Flores, E.; Duff, C.; Woodall, J.; Marrero-Colominas, H.; DeSimone, A.; Beasley, A.; Nguyen, S.; King, S.; Medrano, A. *Coastal Artificial Intelligence and the AI2ES NSF AI Institute*. Oral presentation at the 2023 ASBPA National Coastal Conference, Provide, RI, USA, October 10-13.
- White, M.; Duff, C.; Marrero, H.; Woodall, J.; Vicens-Miquel, M.; Tissot, P. *AI Ensemble Predictions for cold-Stunning Events in the Shallow Laguna Madre, TX*. Oral presentation at the 2023 ASBPA National Coastal Conference, Provide, RI, USA, October 10-13.
- Pilartes-Congo, J.; Kastl, M.; Starek, M.; Vicens-Miquel, M.; Tissot, P. *Implementation of a Zed 2i Stereo Camera for High-Frequency Shoreline Change and Coastal Elevation Monitoring.* Poster presentation at the International Geoscience and Remote Sensing Symposium (IGARSS), Pasadena, CA, USA, July 16-21.
- Vicens-Miquel, M.; Tissot, P.; Medrano, A. *Physics-Based Deep Learning Architectures for Water Level Predictions*. Oral presentation at the American Association of Geographers Annual Meeting, Denver, CO, USA, March 23-27.
- Vicens-Miquel, M.; Tissot, P.; Medrano, A. Artificial Intelligence for Coastal Inundation Predictions. Oral presentation at the Coastal Bend Bays Foundation Coastal Issues Forum, Corpus Christi, TX, USA, March 6.
- White, M.; Tissot, P.; Vicens-Miquel, M.; Duff, C.; Marrero, H. *AI Ensemble Predictions for Cold Stunning Events in the Shallow Laguna Madre, TX.* Oral presentation at the Coastal Bend Bays Foundation Coastal Issues Forum, Corpus Christi, TX, USA, March 6.
- Pilartes-Congo, J.; Starek, M.; Vicens-Miquel, M.; Tissot, P. Implementation of a ZED 2i Stereo Camera for Frequent and Localized

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*Coastal Mapping*. Oral presentation at the 2023 ASPRS Annual Conference at Geo Week, Denver, CO, USA, February 13-15.

- Vicens-Miquel, M.; Medrano, A.; Tissot, P.; Kamangir, H. *Deep Learning Architectures for Water Level Predictions*. Oral presentation at the American Meteorological Society Annual Meeting, Denver, CO, USA, January 8-12.
- White, M.; Tissot, P.; Vicens-Miquel, M.; Hector, M.; Duff, C.; Woodall, J.; King, S.; Williams, J.; Colburn, B. *AI Ensemble Predictions for Cold Stunning Events in the Shallow Laguna Madre*. Poster presentation at the American Meteorological Society Annual Meeting, Denver, CO, USA, January 8-12.
- Kastl, M.; Mahlke, H.; Pilartes-Congo, J.; Vicens-Miquel, M.; Salazar, J.; Nguyen, S.; Tissot, P. *Pier Mounted Stereo Cameras to Measure Time Series of Total Water Levels*. Poster presentation at the American Meteorological Society Annual Meeting, Denver, CO, USA, January 8-12.
- Duff, C.; Woodall, J.; Tissot, P.; White, M.; Vicens-Miquel, M. Long Short-Term Memory Predictions of Water Temperature for Cold Stunning Events. Poster presentation at the American Meteorological Society Annual Meeting, Denver, CO, USA, January 8-12.
- Marines, A.; Ramirez, D.; Vicens-Miquel, M.; Tissot, P. Comparison of Machine Learning Models for Prediction of Water Level at Tide Gauge. Poster presentation at the American Meteorological Society Annual Meeting, Denver, CO, USA, January 8-12.
- Millien, J.; Edwards, D.; Colburn, K.; Vicens-Miquel, M.; Pilartes-Congo, J.; Stephenson, S.; Tissot, P. Change Analysis of Time Series of Beach Digital Elevation Models and Shoreline Wet/Dry Lines. Poster presentation at the American Meteorological Society Annual Meeting, Denver, CO, USA, January 8-12.
- Colburn, K.; Tissot, P., Vicens-Miquel, M. Comparison of Human Delineated Ocean Beach Wet/Dry Shorelines with AI Predictions. Poster presentation at the American Meteorological Society Annual Meeting, Denver, CO, USA, January 8-12.
- Pilartes-Congo, J.; **Vicens-Miquel, M.**; Starek, M.; Tissot, P. *Application of Close-Range Stereophotogrammetry for Predicting Coastal Inundation.*Poster presentation at the American Meteorological Society Annual Meeting, Denver, CO, USA, January 8-12.
- Vicens-Miquel, M.; Medrano, A.; Tissot, P.; Kamangir, H.; Starek, M. Generalized Model for Wet/Dry Shoreline Detection and Total Water Level

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Elevation Using Deep Learning. Poster presentation at the AGU Fall Meeting 2022, Chicago, IL, USA, December 12-16.

- Pilartes-Congo, J.; **Vicens-Miquel, M.**; Garcia, I.; Starek, M.; Tissot, P. Examining Different Photogrammetry and LiDAR Methodologies for Monitoring Coastal Elevation and Shoreline Changes. Poster presentation at the AGU Fall Meeting 2022, Chicago, IL, USA, December 12-16.
- Vicens-Miquel, M.; Tissot, P.; Medrano, A. Deep Learning Architectures to Improve Coastal Water Level Predictions. Oral presentation at the 2022 ASBPA National Coastal Conference, Long Beach, CA, USA, September 13-16.
- Vicens-Miquel, M.; Medrano, A.; Tissot, P.; Kamangir, H.; Starek, M. Generalized Model for Wet/Dry Shoreline Detection Using Deep Learning. Poster presentation at the 2022 ASBPA National Coastal Conference, Long Beach, CA, USA, September 13-16.
- Pilartes-Congo, J.; **Vicens-Miquel, M.**; Kastl, M.; Starek, M.; Tissot, P. *Monitoring Changes in Shoreline and Coastal Elevation Using a ZED 2i Stereo Camera*. Poster presentation at the 2022 ASBPA National Coastal Conference, Long Beach, CA, USA, September 13-16.
- Vicens-Miquel, M.; Medrano, A.; Tissot, P.; Kamangir, H.; Starek, M. Deep Learning Automatic Detection of the Wet/Dry Shoreline at Fish Pass, Texas.

  Oral presentation at the 2022 IEEE International Geoscience and Remote Sensing Symposium (IGARSS), Kuala Lumpur, Malaysia, July 17-22.
- Vicens-Miquel, M.; Medrano, A.; Tissot, P.; Kamangir, H.; Starek, M. Deep Learning Generalized Model for Wet/Dry Shoreline Detection. Oral presentation at the 2022 Texas Coastal Symposium, Corpus Christi, TX, USA, April 14.
- Vicens-Miquel, M.; Medrano, A.; Tissot, P.; Kamangir, H.; Starek, M. Georeferenced AI Wet/Dry Shoreline Detection using UAV Imagery. Oral presentation at the ESRI Imagery and Remote Sensing Summit, Virtual, March 31.
- Vicens-Miquel, M.; Medrano, A.; Tissot, P.; Kamangir, H.; Starek, M. Automated Wet/Dry Shoreline Delineation Using Deep Learning. GeoAI and CyberGIS for Advancing Spatial Decision Making. Oral presentation at the American Association of Geographers Annual Meeting, New York, NY, USA, February 25 March 1.
- Vicens-Miquel, M.; Medrano, A.; Tissot, P.; Kamangir, H.; Starek, M. Deep Learning Wet/Dry Shoreline Detection Using UAV Imagery. Oral

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presentation at the American Meteorological Society Annual Meeting, Houston, TX, USA, January 23-27.

- Vicens-Miquel, M.; Medrano, A.; Tissot, P.; Kamangir, H.; Starek, M. Wet/Dry Shoreline Detection Using Deep Learning. Oral presentation at the 2021 ASBPA National Coastal Conference, New Orleans, LA, USA, September 28 October 1.
- Rahnemoonfar, M.; Robin, M.; Vicens-Miquel, M.; Dobbs, D.; Adams, A. Flooded Area Detection from UAV Images Based on Densely Connected Recurrent Neural Networks. Oral presentation at the 2018 IEEE International Geoscience and Remote Sensing Symposium (IGARSS), Valencia, Spain, July 22-27.

#### **HONORS AND AWARDS**

2022 – 2023	TAMUCC International Presidential Graduate Research Scholarship (\$4,000)
2022 - 2023	TAMUCC College of S&E Graduate Research Scholarship (\$1,000)
2022 – 2023	TAMUCC College of Engineering Graduate Research Scholarship (\$1,041.67)
2022 - 2023	TAMUCC Geospatial Engineering Graduate Research Scholarship (\$500)
2023	Co-Author for American Meteorological Society Artificial Intelligence Conference Poster Winner (\$300)
2022	American Geophysical Union Outstanding Student Presentation Award (OSPA) recipient (\$250)
2021 – 2022	TAMUCC International Presidential Graduate Research Scholarship (\$4,000)
2021 - 2022	TAMUCC College of S&E Graduate Research Scholarship (\$2,000)
2021 - 2022	TAMUCC Geospatial Engineering Graduate Research Scholarship (\$600)
2020 – 2021	TAMUCC International Presidential Graduate Research Scholarship (\$3,141)
2020 - 2021	TAMUCC College of S&E Graduate Research Scholarship (\$1,000)
2020 – 2021	TAMUCC Division of Research and Innovation Student Research Competition Award (\$800)

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2020 - 2021	TAMUCC Geospatial Engineering Graduate Research Scholarship (\$1,000)
2019 - 2020	Athletic Department 5th Year Scholarship (\$10,312.49)
2019 - 2020	Ruth A. Campbell School Endowed Scholarship (\$500)
2019 - 2020	Evening Post Pub CoKRIS TV Scholarship (\$500)
2019 - 2020	Exxon USA Found Scholarship (\$500)
2018 - 2019	M Collins UG Scholarship (\$8,400)
2017 & 208	NCAA Division I Tennis two-time first team All-Conference in singles (Southland Conference)
2015 - 2020	6-time Dean's List Recipient
2015 - 2020	8-time Athletic Department Academic Roll Recognition
2015 - 2018	3-time Scholar Student-Athlete

#### **REFERENCES**

Dr. Philippe E. Tissot Conrad Blucher Institute Chair for Coastal Artificial Intelligence Texas A&M University – Corpus Christi 6300 Ocean Drive, TX 78412 Email Address: philippe.tissot@tamucc.edu

Dr. Michael J. Starek Professor of Geospatial Engineering Texas A&M University – Corpus Christi 6300 Ocean Drive, TX 78412

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