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Pan-American Sensors for Environmental Observations (PASEO): an interdisciplinary Pan-American Advanced Studies Institute (PASI)

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CENS TEOS, Contam, and NAMOS groups: ¹UCLA, ²UC Merced, ³USC

Introduction: A advanced, interdisciplinary training program

PASEO overview:

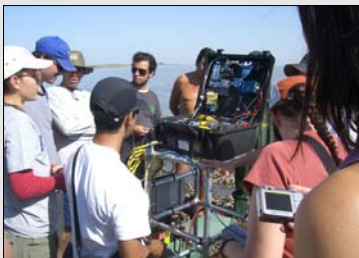
- **Support:** CENS infrastructure + Pan-American Advanced Studies Institute (NSF PASI program); OISE #0735084
- **Host institutions:**
 - Instituto Argentino de Oceanografía (IADO), Bahia Blanca, Argentina & Instituto Nacional de Tecnología Industrial (INTI), Buenos Aires, Argentina
- **Participants:** 30 participants, including instructors, early career faculty, postdocs, and graduate students representing the **US, Argentina, Brazil, Chile, Colombia, and Germany**
- **Backgrounds** ranged from limnology to lab-on-a-chip fabrication

PASEO objectives:

Our overall objective was to facilitate **group learning and future international collaboration** by directing an interdisciplinary mix of participants through a series of **hands-on experiences** in which different subsets of the group are more expert than the others...



Problem Description: How can we better develop environmental sensor systems?



See more at: <https://eng.ucmerced.edu/paseo/>

Sensor systems are growing in their utility and significance, yet **key gaps persist with respect to sensor modes and deployment strategies**. How can we close these gaps more quickly?

The underlying thesis of PASEO is that environmental sensors systems would mature more quickly, and to a better end, if **scientists and engineers adept in the application of sensor systems worked collaboratively with their counterparts more focused on sensor system development**. Furthermore, such collaborations could only benefit if they were extended internationally. In the PASI context, for example, geography and climate issues in South America and North America are attractive for efficient comparative studies focusing on science questions and engineering problems of mutual interest.

Proposed Solution: Interweaving the technology development and application experience!

PASEO curriculum:

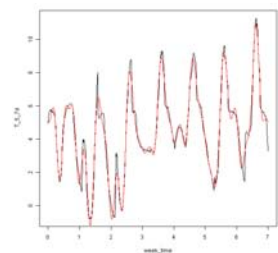
The short course was 13 days in duration. The first 10 days of the training emphasized a combination hands-on field activities (sensor deployments) and lectures on the underlying scientific principles. Students carried out end-to-end deployments (sensor system design, installation, and data synthesis) in the context of (1) aquatic, (2) terrestrial, and (3) coastal margins (salt marsh). The final 3 days took place in the clean rooms at INTI, where the participants stepped through the design, fabrication, and testing of an LTCC nitrate sensor.

PASEO post-course survey

1. This course was interesting and will be useful for my career.
2. The course was well-organized with respect to travel and housing, and sufficient resources were provided to cover my expenses.
3. I found interactions with scholars from countries other than my home country to be interesting and useful during the course.
4. The field trips (salt marsh, lake, estuary) and hands-on activities for the course were interesting and useful.
5. The lecture portions of the course were interesting and useful.
6. The laboratory (sensor fabrication) portion of the course was interesting and useful.
7. I feel comfortable contacting the PASEO instructors and participants in the future for consultation and collaboration.
8. I found the portions of the course NOT related to my research to be interesting and useful in terms of broadening my perspectives on environmental observations and sensors.



Participants break down the GLEON lake metabolism buoy (left); Using CENS TEOS Fourier transform teaching module to learn to model soil energy balances (below).



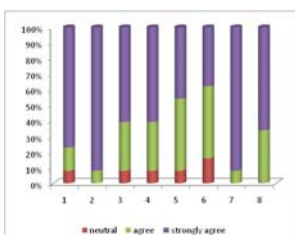
(left) Participant completing a LTCC-based nitrate sensor prototype at INTI Labs.

A sampling of additional comments on the PASEO experience (non-edited, anonymous):

I think that the interaction alone justifies the simposium, but there was also a much broader theme that seemed obvious to me but needs some follow-up: that even the most common off-the-shelf sensor technology is not really that available in South America, and that we need to develop the local capacity to produce our own monitoring sensors

The international and interdisciplinary collaboration was unsurpassed!!! A somewhat more formal "network" list of contacts would be nice to promote future collaborations. Lagoon day seemed slow and lacking some direction. THANK YOU!!!!!!

The PASEO training program was very useful in order to have a better understanding of the differents sensor and their deployment in different environments. Furthermore, I consider that PASEO provide an excellent opportunity to make new contacts and bonds with other reserchers and also a good experience to exchange differents cultures.



(above) Participants touring the INTI clean room facilities.