



TRR 181 NEWSLETTER

# ENERGY INFLOW

## Hey Ho: Let's go off to phase 3!

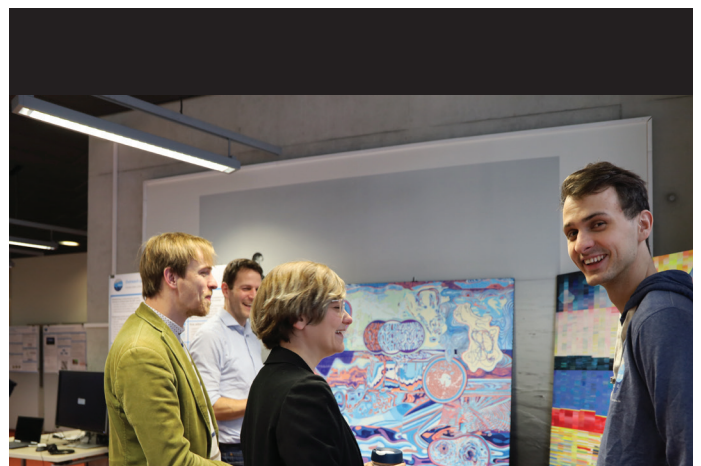
How exciting the first half year of 2024 was for the TRR 181: First the preparations for the Review in February, then all the excitement during the Review and finally the good news in May: "Energy Transfers in Atmosphere and Ocean: Extended for Four More Years!" It's been a lot of work for everyone in the project, so again, we cannot say it too often: Thanks so much to everyone who helped in the process!

In this Newsletter you find:

- a **report of the Annual Retreat** in Lüneburg
- an impressive **list of new publications** and an outlook on what will happen in November
- **reports from research stays** of our Early Career Scientists
- a **report by Artist Radoš Vujaklija**.

If you want to contribute to the newsletter, don't hesitate to get in touch with me.

Jennifer



## REPORT - ANNUAL RETREAT 2024 IN LÜNEBURG

*From September 23-25, 2024, TRR researchers gathered in northern German Hansestadt Lüneburg for the TRR 181 Annual Retreat: three days filled with engaging talks, discussions, and opportunities to collaborate. It was a perfect chance to reconnect, reflect on the project's progress, and plan the next steps of the third and final phase of TRR181.*

*Text: Celine Gradwohl, Research assistant*

### Day 1: Kicking Off with Talks and Games

The retreat started with a welcome talk from Carsten Eden, who set the stage by introducing the third phase of TRR 181. His introduction was followed by an engaging Mercator talk from Jean Bidlot from ECMWF in the UK, with the topic "Ocean wind waves in ECMWF Earth System Model", sparking plenty of interest and thoughtful discussions.

After a lunch break, things got interactive with an Intercultural Competence Workshop led by trainer Anna Storck. The highlight

was the interactive role game "Bafa Bafa", where participants experienced the challenges of navigating a new culture. It was a fun and thought-provoking way to understand how communication barriers can shape our experiences.

In the afternoon, smaller breakout sessions provided a space for focused discussions on key topics, and the first poster session offered researchers the chance to share the recent results of their subprojects. The day ended on a relaxed note with dinner, giving everyone time to unwind and continue chatting informally. One group also gathered in the basement of the hotel, where a traditional "Kegelbahn", similar to a bowling lane, is set up and enjoyed themselves while "kegeln".

### Day 2: Science and Sightseeing

The second day kicked off with another Mercator talk about "The wave-mediated ocean-atmosphere system" this time from Øyvind Breivik from University of Bergen. Later, TRR 181 coordinators Lea Diederichsen and Jennifer Fandrich gave an insightful presentation on

the coordination tasks, the Outreach subproject and the TRR's graduate school, highlighting the behind-the-scenes efforts that keep the project running smoothly.

After lunch, subproject teams presented their progress in two PICO Sessions divided into the five research areas of the TRR. The presentations sparked plenty of questions and discussions, keeping everyone engaged. For those in need of a break from science, a tour of Lüneburg and the Salt Museum was a refreshing change of pace, while some researchers chose to stay back and continue their scientific conversations or just to have a cup of coffee.

Before dinner, a second poster session provided another round of discussions, as researchers eagerly delved into the details of each project.

### Day 3: Wrapping Things Up

On the final day, the last Mercator talk was given by Rupert Klein from FU Berlin. We heard about "Energy transfers in an incipient hurricane", rounding off the series of inspiring presentations. Coordinator Lea



followed with a presentation of the results of the most recent survey of TRR project leaders and early career scientists, offering insights into the group's feedback and areas for improvement. Afterwards, four breakout groups formed and started planning the upcoming fundamental courses for the new PhD students.

The final wrap-up round with the General Assembly elected new TRR members and the new Vorstand members, before everyone came together for a final lunch.

As the TRR 181 team departed Lüneburg, we all left with fresh inspiration, new connections and

a few more brain cells working overtime.

From the intense discussions to the cultural games and city tours, this retreat was a perfect reminder of why we love doing science.

## PUBLICATIONS

*Have you also published your work, but cannot find it here?  
Please get in touch with the [project coordination](#).*

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## UPCOMING EVENTS

### November 5, 2024

#### TRR 181 Seminar

The TRR 181 seminar is held by Pragallva Barpanda (University of Bergen).

### November 6, 2024

#### TRR 181 Seminar

The TRR 181 seminar is held by Prof. Rupert Klein (Freie Universität Berlin).

### November 6, 2024

#### RTG ENERGY Meeting

Every other Thursday at 2pm the TRR PhDs and Postdocs meet online to discuss their research and talk about current TRR issues.



## REPORT - RESEARCH STAY IN SAN DIEGO BY ZOI KOURKOURAIDOU

*In February 2024, Zoi Kourkouraidou did a research stay at the SCRIPPS Institute of Oceanography in San Diego, USA.*

*by Zoi Kourkouraidou, PhD student W2*

Last February I had my first research visit. After participating at the "Ocean Sciences Meeting 2024" in New Orleans, I crossed the continent and landed in beautiful San Diego, California. I visited the MOD Lab at SCRIPPS Institute of Oceanography, a team of oceanographers, engineers and PhD students who work on multi scale ocean dynamics.

Most specifically, I visited Dr. Amy Waterhouse who arranged for a rich and very fruitful schedule of meetings with both senior and early career researchers both from SCRIPPS and



also from the University of San Diego (UCSD). I had the chance to learn about their work, was given a nice tour through their lab and also attended some of their seminars and one PhD defence. At the end of the week I was given the opportunity to present my own work in the CASPO seminar, where I got many interesting questions and inputs for my research.

The week went by very fast unfortunately, but I'm still very grateful for having the chance to network with so many researchers, learn about their science and visit this legendary institute! On top of these, I will certainly not easily forget the beautiful walks along the La Jolla beach, the stunning sunsets and the unique experience of going surfing during lunch break!

I am thankful to Amy for hosting me and taking care of my schedule and of course to the CRC181 for the funding.

## REPORT - RESEARCH STAY IN SOUTHAMPTON BY EVRIDIKI CHRYSAGI

*In November 2023, Evridiki Chrysagi did a research stay at the National Oceanographic Center in Southampton, UK.*

*by Evridiki Chrysagi, Young PL in T2*

In November of last year, I had the opportunity to visit Southampton, UK, and spent a month at the National Oceanographic Center (NOC). Upon my arrival, I found myself in the midst of a literal and metaphorical storm. Shortly after reaching Southampton, a severe storm hit the area. My landlord advised me to stay indoors, and my host had to cancel our initial meeting due to closed bridges preventing access to the institute. While the physical storm passed after a few days, I still had to "weather the storm" of proposal writing. With the deadline for the third phase of the TRR approaching in mid-November, I dedicated a significant



amount of my time to the proposal writing.

My main host, Alberto Naveira Garabato, a distinguished expert on submesoscales processes and mixing, proved to be not only a brilliant scientist (recently awarded the Fridtjof Nansen Medal) but also a warm and welcoming person. Bieito Fernandez Castro was also a great host, so I really enjoyed working at NOC. We had several meetings to

discuss my results, and Alberto was very enthusiastic about my Baltic Sea simulations, saying he now understands why the Baltic is considered an ideal natural laboratory. We plan to write two joint papers: one focusing on the submesoscale

instabilities and the vorticity generation above sloping topography, and another one (hopefully) focusing on the generation of submesoscale eddies in the oceanic interior and the lateral exchange of properties between the boundaries and the interior of the ocean. During my research stay, I also had the opportunity to present my work at the physical oceanography seminar



at NOC, attend various seminars, and meet and discuss with many people. Exploring Southampton and its surroundings, I visited the local pubs with different groups of colleagues, further enriching my experience.

As the saying goes, “After every storm, the

sun always shines”, and indeed, my experience in Southampton was a testament to this. I would therefore like to thank TRR for funding my research visit. It was a unique experience and I would strongly recommend and encourage everyone to seize the opportunity to visit other institutes

and universities.

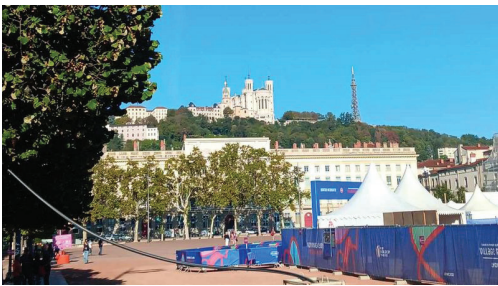
## REPORT - RESEARCH STAY IN LYON: EXPLORING ATMOSPHERIC DYNAMICS

*In October 2023, Mohamed Mossad did a research stay at the École Centrale de Lyon in Lyon, France.*

*Text: Mohamed Mossad, PhD student W1*

From the 1st of October and until the 14th, I had the opportunity to embark on a short research stay in Lyon, France, funded by the project TRR181 at École Centrale de Lyon. This period was not just a chance to collaborate and learn but also a stepping stone in my understanding of atmospheric dynamics, particularly regarding gravity wave (GW) spectra.

My time in Lyon was spent working alongside Raffaele Marino (scientist at CNRS, France) and the team at the Laboratory Mechanical Des Fluides Et



D'acoustique (LMFA). The environment at LMFA was not only academically stimulating but also warmly welcoming, fostering both professional growth and personal connections.

One of the most enlightening aspects of this visit was the shift in my perspective on the processes which contribute to the canonical GW spectra. Discussions about turbulence and the scaling of gravity wave spectra opened my eyes to

the broader physics underlying these phenomena. It was a transition from focusing merely on the slope of gravity wave spectra to understanding the vast, open-ended field of their scaling.

A highlight of my stay was exploring the relationship between the Froude number and statistics (kurtosis) of velocity and temperature fields. Although time constraints didn't allow for its application on lidar data, the concepts presented were inspiring and thought-provoking.

Our work concentrated on validation of spectra from direct numerical simulations (DNS) against lidar data, scrutinizing how different wind regimes affect GW spectra. This involved a detailed comparison of integrated kinetic energy/scalar spectra with lidar data.

Leaving Lyon, I am armed with an array of studies and topics to delve into, especially regarding the comparison with DNS regimes. These studies are pivotal in enhancing our interpretation of GW data from lidar measurements. I am optimistic about the continuation of this collaboration in the future and the potential for significant findings.

Beyond the academic realm, Lyon itself proved to be a delightful experience. The city's transportation system was notably efficient which made commuting a breeze. The streets of Lyon are filled with friendly faces, many of them young students, also the 2023 Rugby World Cup was taking

place there which added a lively and diverse vibe to the city. École Centrale de Lyon, nestled in this vibrant environment, struck me as an exceptional place for study and research, providing many chances to do sports as well.

I extend my deepest gratitude to the entire team at LMFA for their hospitality and support. Special thanks go to Raffaello Foldes and Fabio Feraco (IAP) for their invaluable help in answering my questions and assistance with data provision.

My research stay in Lyon was not only productive but also immensely rewarding. It has broadened my understanding and has surely impacted my approach to atmospheric science. I am grateful for this experience and hopeful that my contributions, though a fraction, have added value to our collective research endeavors.

## SOMETHING SCIENCE-ARTSY FOR THE END

*Designer Radoš Vujaklija created a video using the so-called “carding”-technique, gaining his inspiration by interviews with TRR181-members. The film was presented in an exhibition at Zollo offspace, in Hammerbrook, Hamburg and forms the basis for further film projects by the artist.*

*Text by Artist Radoš Vujaklija*

In early 2023, I began imagining a sci-fi world that I would eventually make a film about, set on Earth in the distant future. In this world, resources are scarce, life doesn't happen easily, and the descendants of humans are among the few surviving complex organisms. They have reconstructed their own DNA sequences multiple times and integrated synthetic organs and mechanical parts.

In September 2023, I met with Jennifer Fandrich to discuss the possibility of developing some aspects of this fictional world through an exchange with researchers and professors involved in the TRR181 project. We set a plan: I would leave the creatures and characters aside and discuss the meteorological possibilities of this world with the researchers.

What followed was a period of six months during which I conducted individual interviews with the scientists that had replied to my open invitation. In the first round of interviews, I spoke with Moritz Epke, Prof. Maren Walter, Quan Liu, Venkata Siva Subrahmanyam Kattamuri and Prof. Jens Rademacher.

An early eye-opening experience was my interview with Prof. Maren Walter, during which I realized that I had no excuse not to include subaquatic existence along with life on land—the people of the future will surely be able to move freely through both the ocean and the atmosphere.

It was striking to see that physicists and mathematicians don't treat the oceans and the atmosphere as two separate worlds (as we, mere mortals, do). This

is largely because, in terms of physics, both are fluids, and thus the same equations apply in most cases.



Another turning point was noticing that ocean eddies have become a hot topic in this field of research in recent years. Technology has evolved enough to measure meso- and submesoscale phenomena, and the influence of eddies on the ocean and the atmosphere has been underestimated in scientific circles in previous centuries.

In the next round of interviews, which I conducted with Nils Brüggemann, Prof. Stephan Juricke, and Evridiki Chrysagi, I chose to focus on the topic of eddies. It is established that eddies can influence the amount of oxygen in the water, the amount of salt, the biomass and the weather in the atmosphere.

Another active research topic was the influence of physical obstacles, such as small islands, on the creation of eddies. Eddies are formed by turbulence in the flow of the fluid, so it is logical that a physical obstacle disrupting the flow will cause the so-called shedding of new eddies.

At this point, I was ready to perform the creative gesture within my fictional world: What if the inhabitants of this world tried to make the ocean waters and the atmosphere work in their favor by strategically placing large mesoscale physical obstacles and thus controlling the formation of eddies and all the effects that eddies can cause?

I decided to sketch out a story in which the inhabitants of the future world attempt to do exactly that, and, having inherited the foolishness of their ancestors, their greed becomes their doom.

I made a video that I showed in an exhibition at an offspace called Zollo, in Hammerbrook, Hamburg. The technique I used to organize the content of the video is called “carding” and it is typically used by scriptwriters. To put it most simply, you lay out pieces of your story and ideas in cards and then you try reordering them in different sequences until you get a sensible outline of what you want to tell.

This video is now uploaded here and presents the outlines of the concept, the story, and tries to convey the taste of the atmosphere that my future films set in this world will have. The exhibition was accompanied by a music playlist that served as a soundtrack, but since I have no rights to those tracks, the video shown here is silent.

Besides the ideas shown in the video, I have brainstormed various other ideas with the scientists, which I have noted down and might use for other stories told within this world. I thank everyone wholeheartedly for this unique experience.

Main content created by Jennifer Fandrich, other authors are credited respectively  
E-Mail: [trr181.cen@uni-hamburg.de](mailto:trr181.cen@uni-hamburg.de)  
Web: [www.trr-energytransfers.de](http://www.trr-energytransfers.de)  
Twitter: [@TRREnergy](https://twitter.com/TRREnergy)  
Mastodon: [@TRR\\_181](https://mastodon.social/@TRR_181)