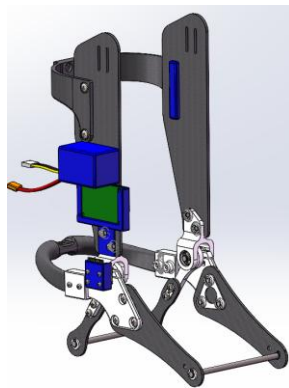
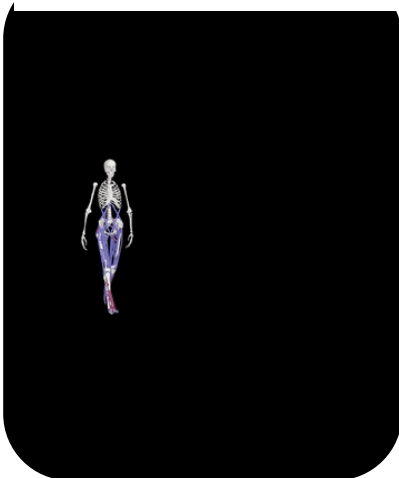
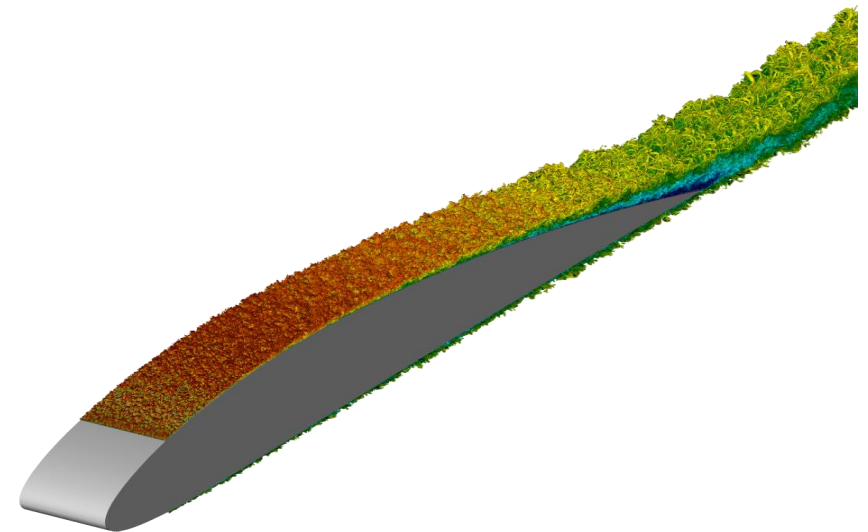
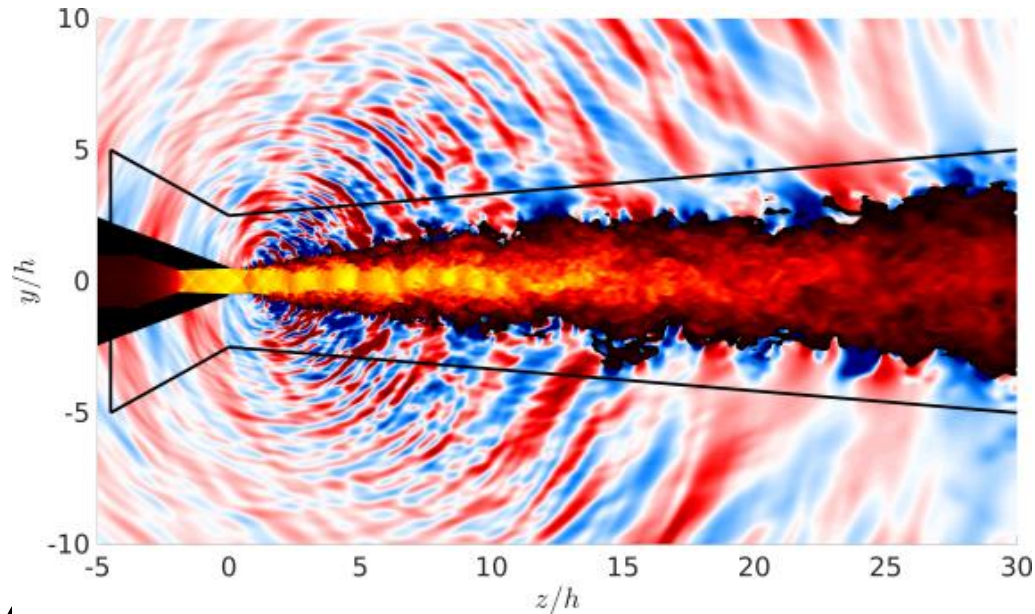


Candidate Degree Project (KEX jobb-Mekanik)



*Ruoli Wang, Associate Prof.
Promobilia MoveAbility Lab
Engineering Mechanics, SCI*

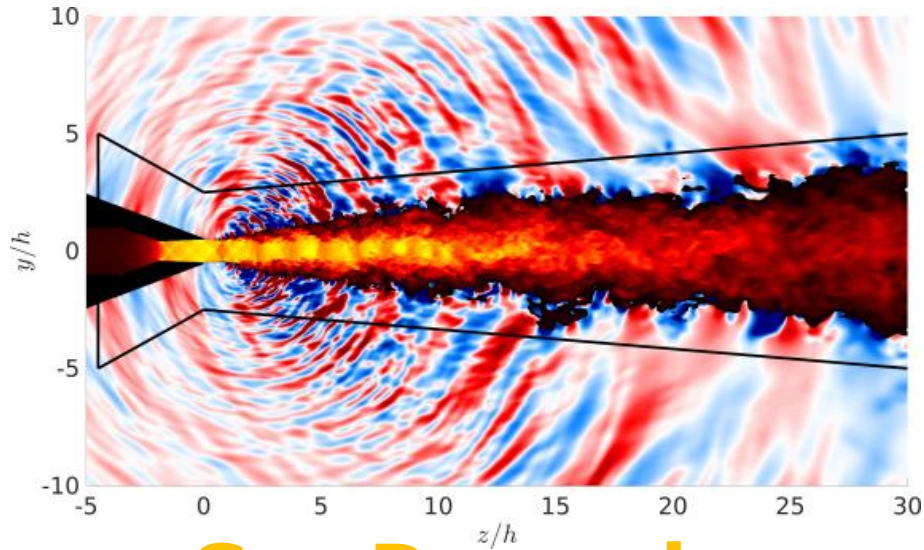
Contact information:

ruoli@kth.se

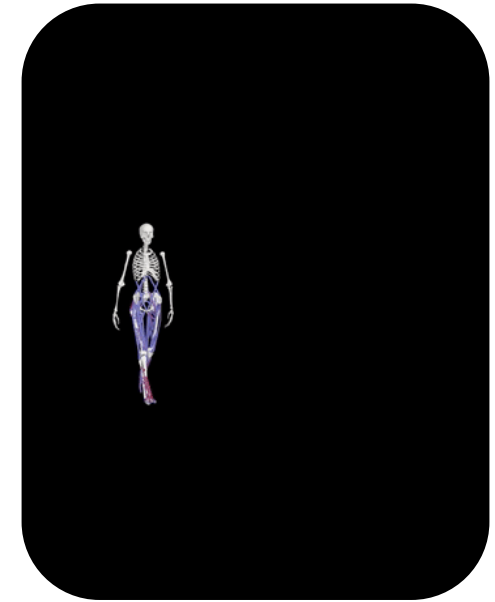




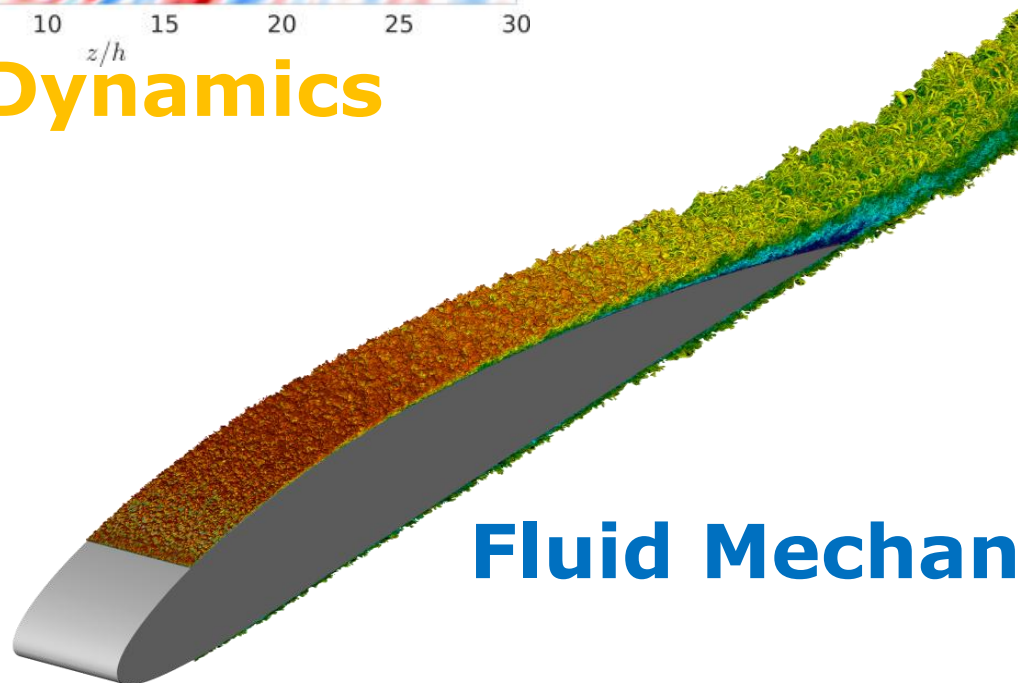
KEX projects within 3 main areas



Gas Dynamics



Biomechanics

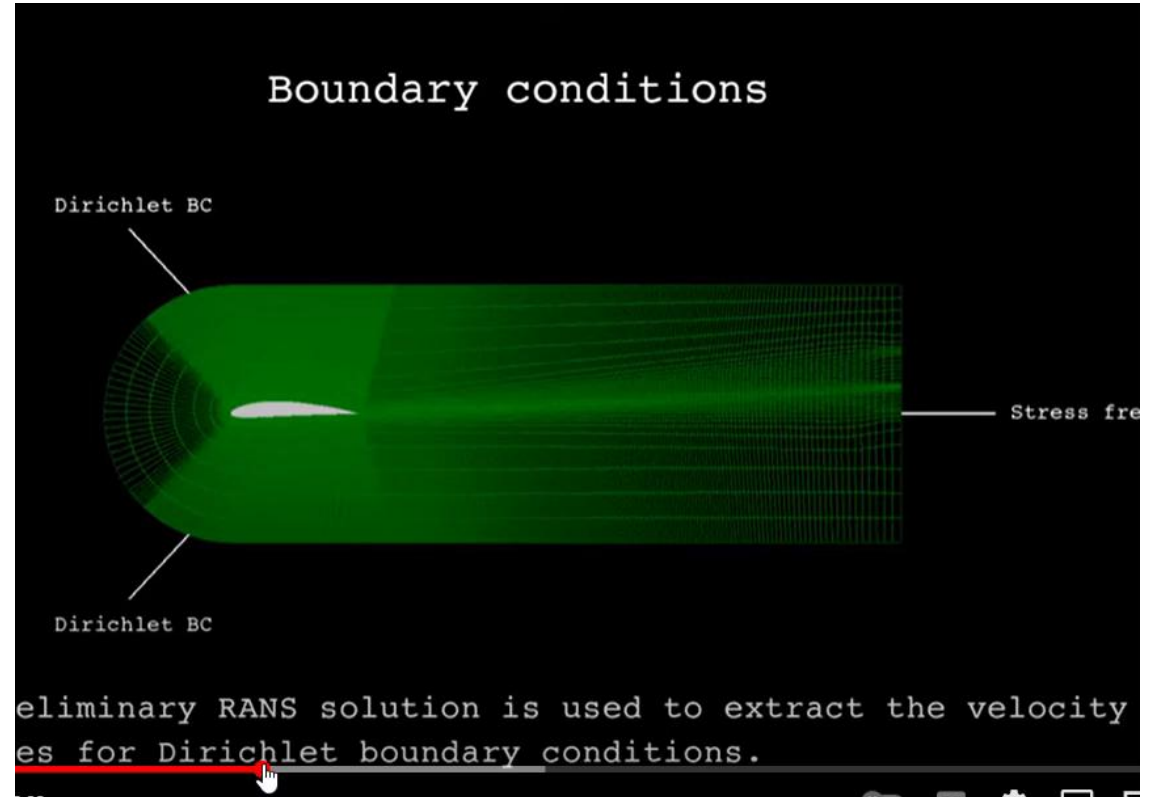
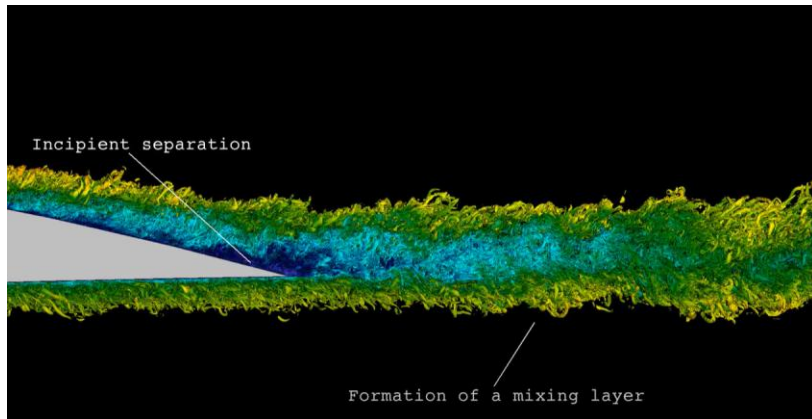


Fluid Mechanics



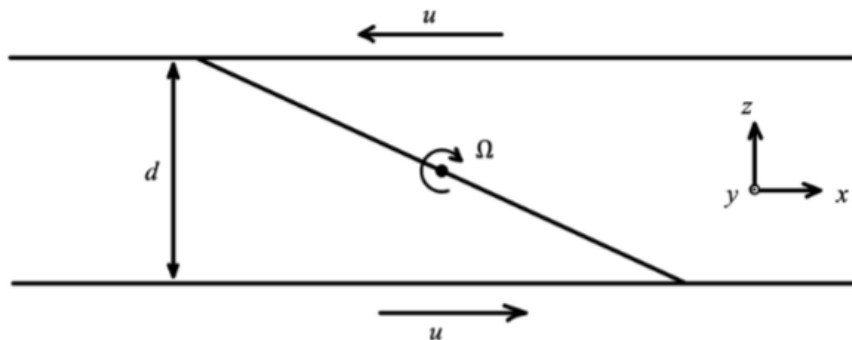
Fluid Mechanics

Computer simulations (CFD)



<https://www.youtube.com/watch?v=aR-hehP1pTk>

Numerisk studie av flödesregimer i roterande Couetteströmningar

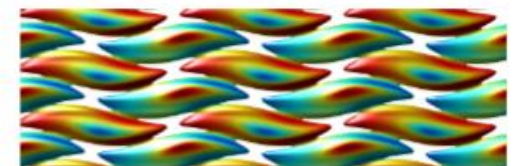


Figur 1: Mätupställning sedd från ovan för förtydligande.

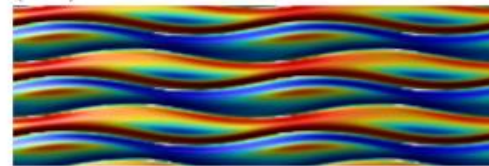
4.3 $\Omega = 0.1$



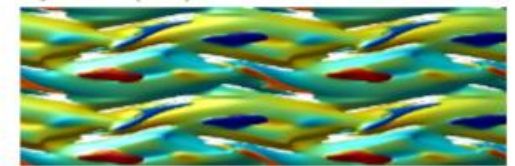
(a) $Re = 150$. Stabil rörliknande flödesstruktur (SRF)



(b) $Re = 300$. Stabilt vågig rörstruktur med separation (SVS)



(c) $Re = 600$. Stabilt vågig rörstruktur (SVR)

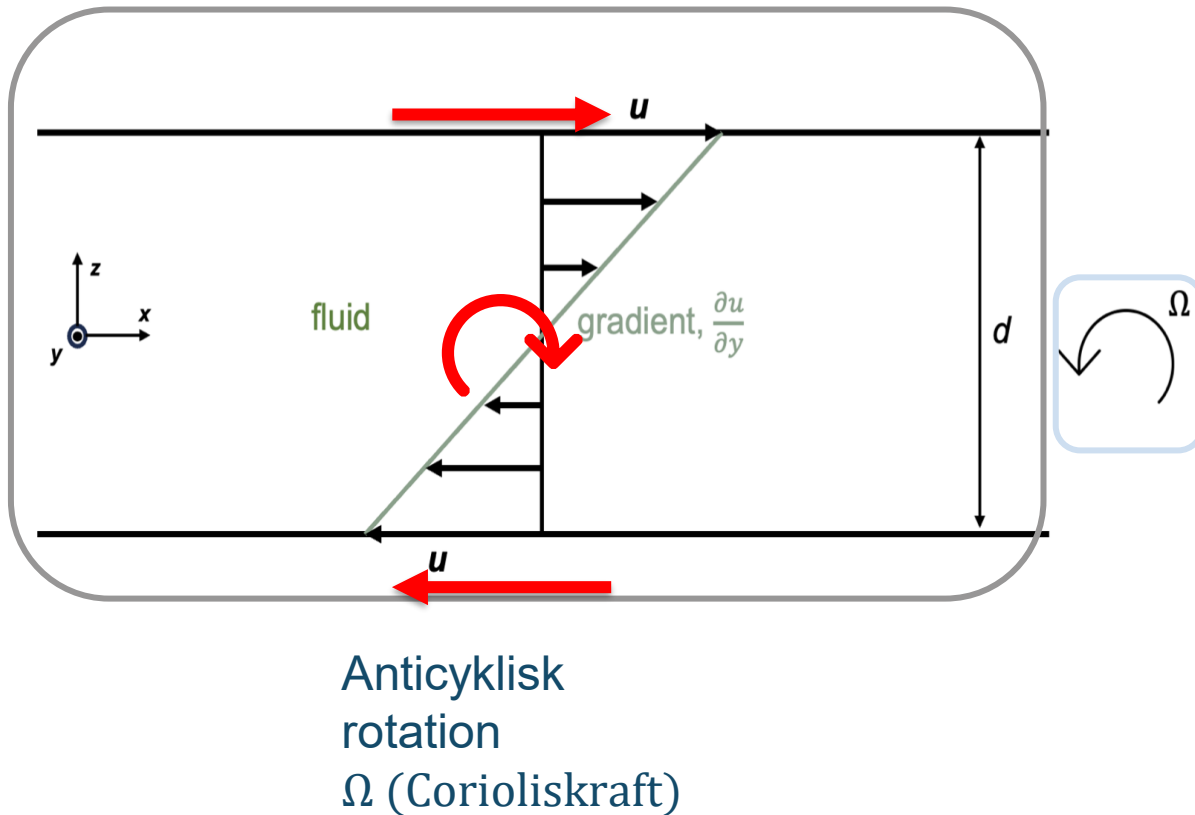


(d) $Re = 900$. Instabilt vågig rörstruktur, påbörjan till turbulent flöde (IBT)

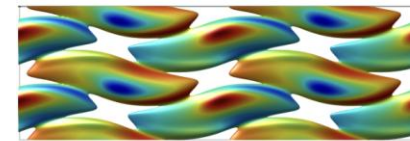
Figur 10: Med $\Omega = 0.1$ och olika Reynoldstal.

Courtesy to Nils Abrahamsson and Carl Lundberg

Hög anticyklisk rotation i Plan Couette-Flöde



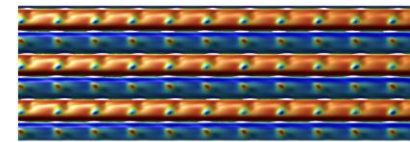
Distinkta flödestyper



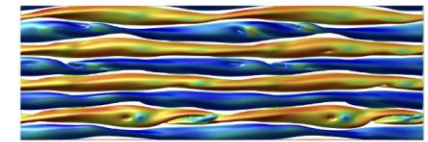
(a) Ovals Strukturer (OVS)



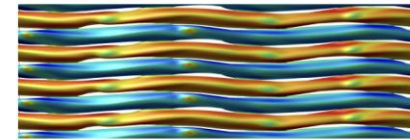
(b) Raka Skjuvlager (RAK)



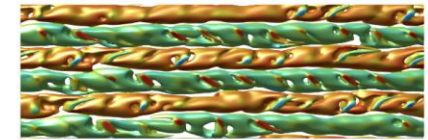
(c) Raka Skjuvlager med Små Virvlar (RAV)



(d) Vågiga skjuvlager med Inflektionspunkter (INF)



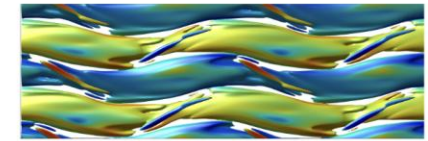
(e) Vågiga Skjuvlager med Små Virvlar (VSV)



(f) Lokal Turbulens med Skjuvlager (LTS)



(g) Raka Skjuvlager med Lokal Turbulens (RLT)

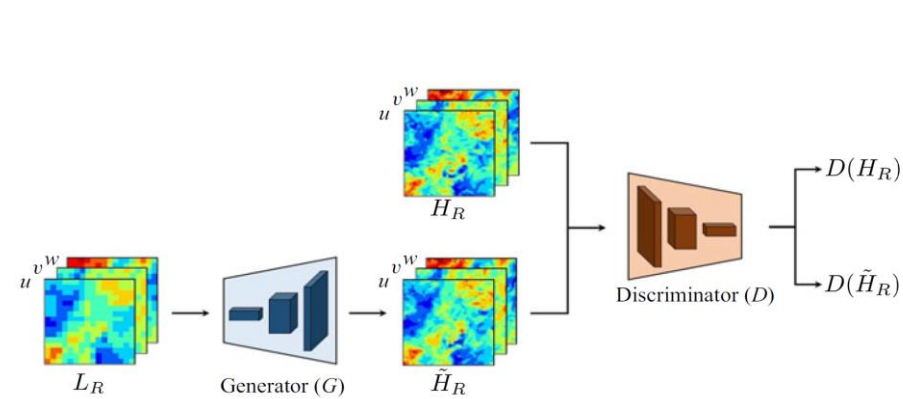


(h) Sinusformat Vågigt Flöde (VÅG)

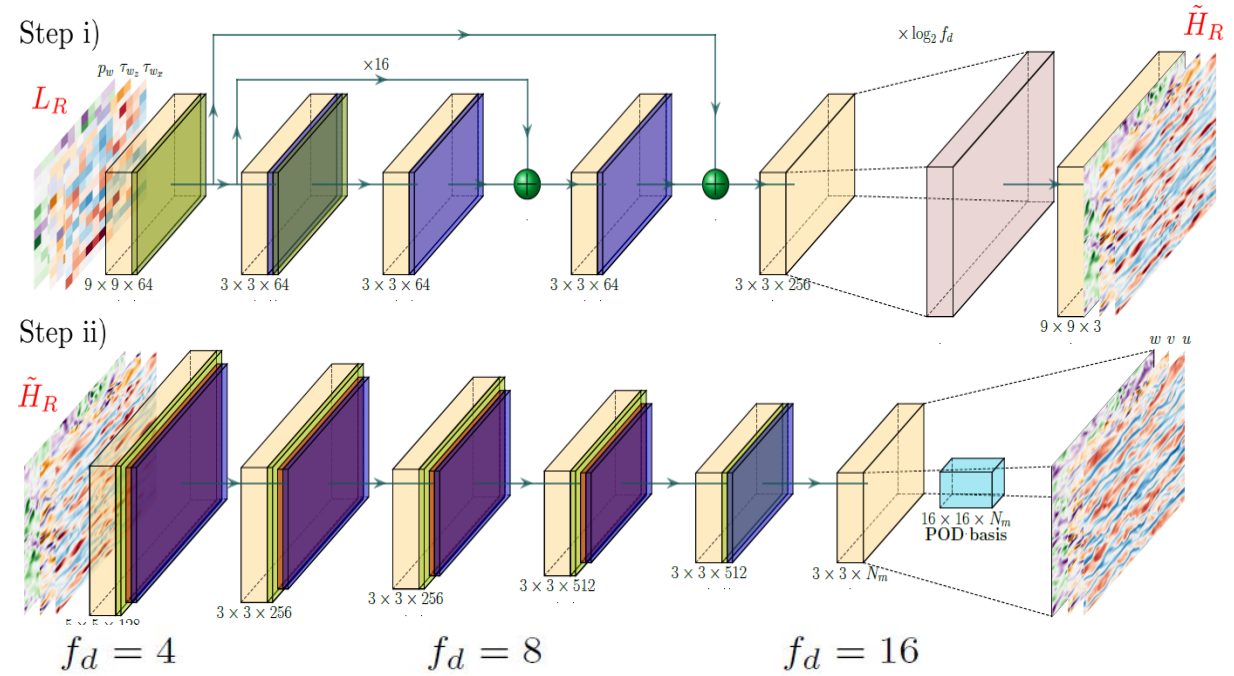


(i) Fullständigt Laminärt (FLA)

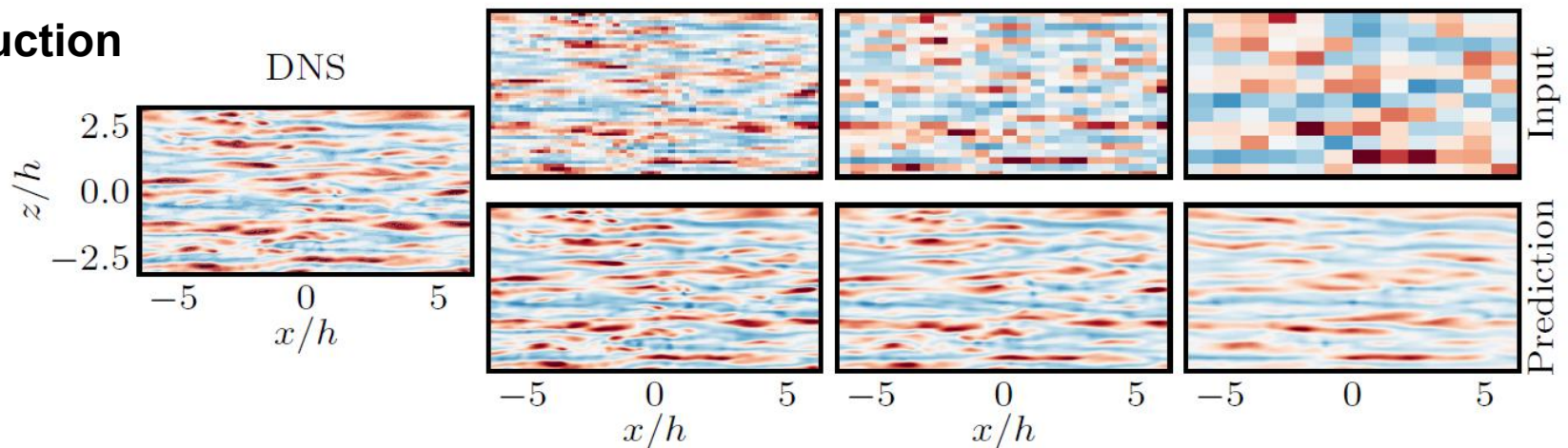
Courtesy to Karl Tajthy



Kim et al., (2021)

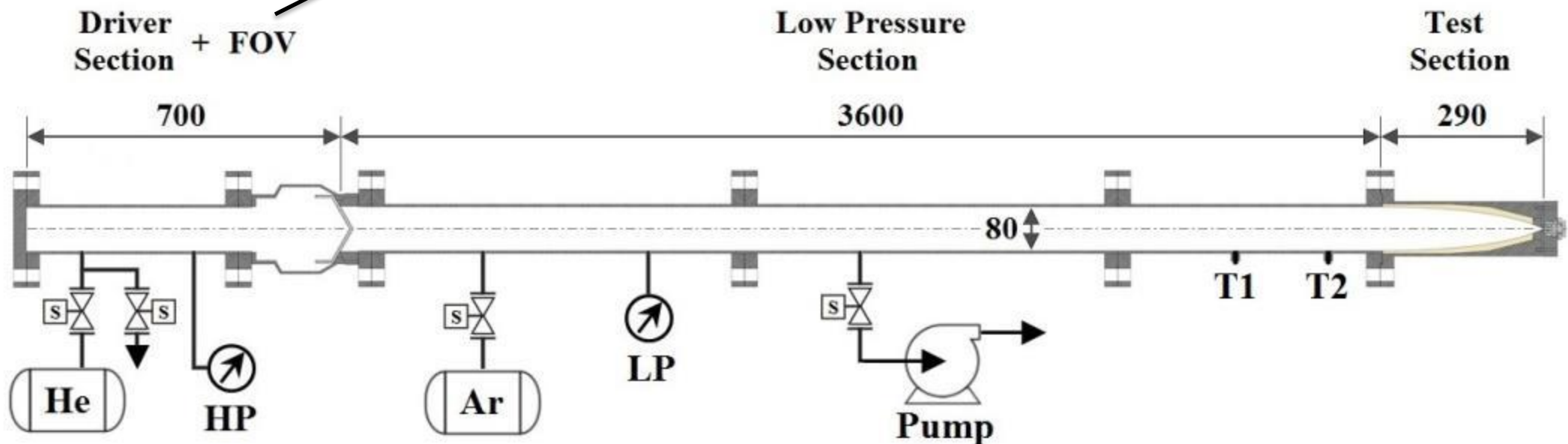
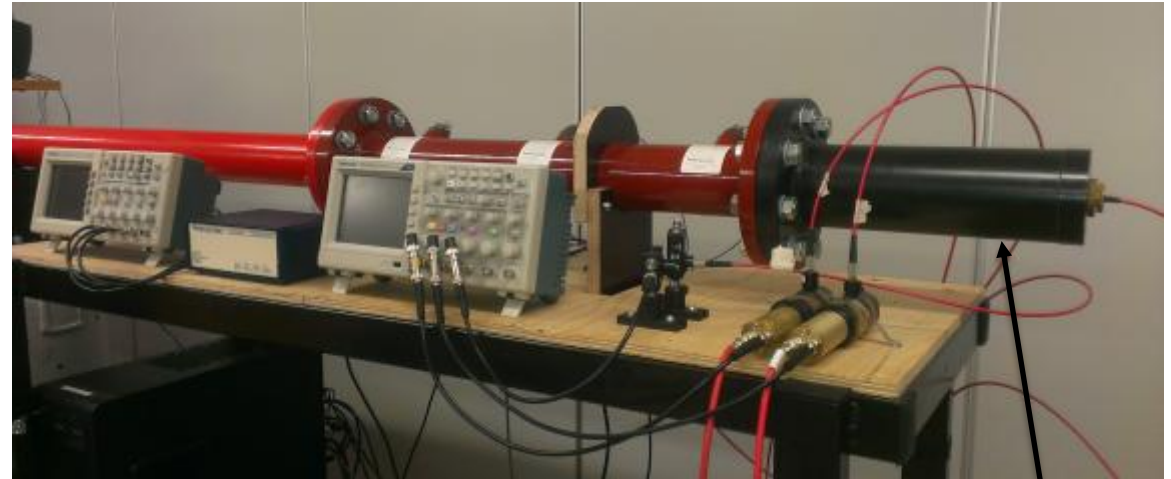
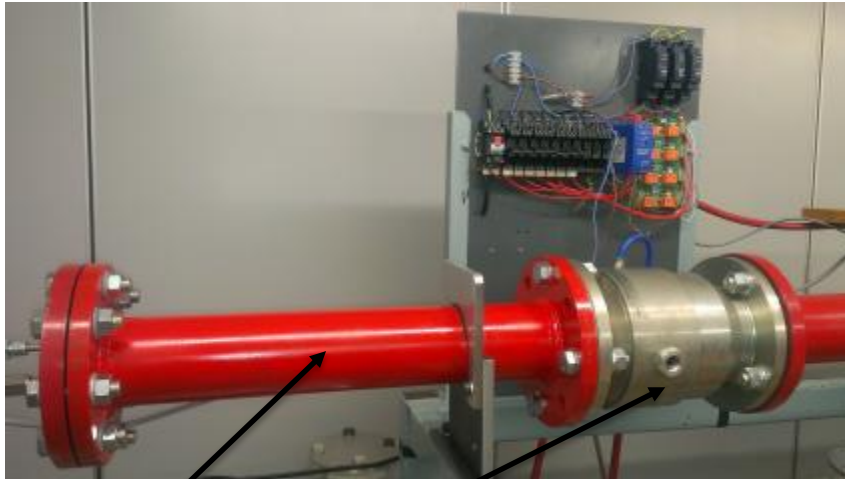


Wall reconstruction



Güemes et al., Phys. Fluids (2021)

Shock tube



Example Project

Study of particle dynamics, pair dispersion and clustering in gravity-capillary wave turbulence

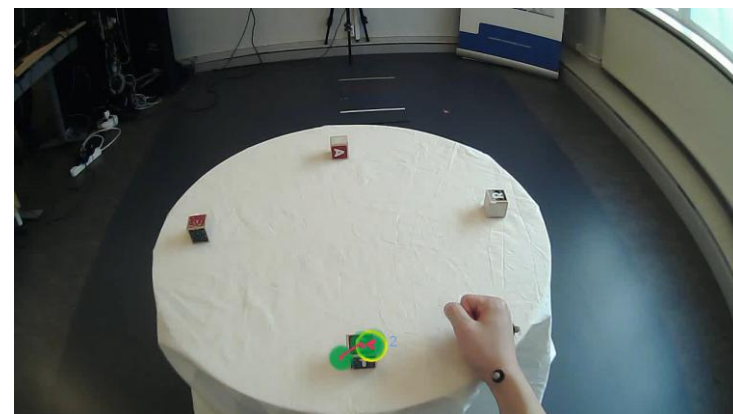
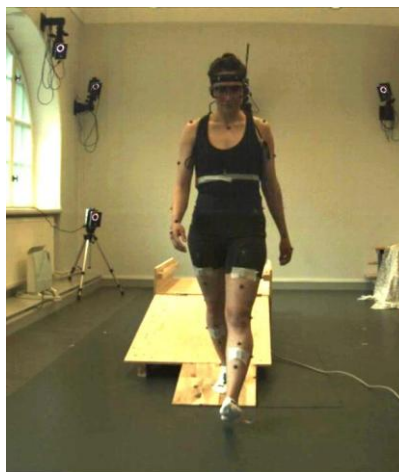
Introduction

- The accumulation of plastic in the ocean is a big problem
- We conduct experiments to investigate how plastic particles behave in the ocean
- We then try to validate a stochastic model describing the particle movement by comparing with experimental results.

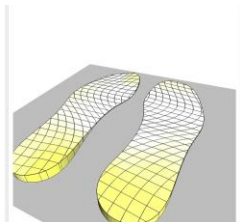
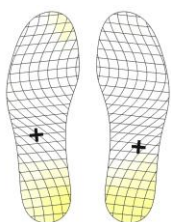


Courtesy to Matteo Brant and Giuseppe Ponzio

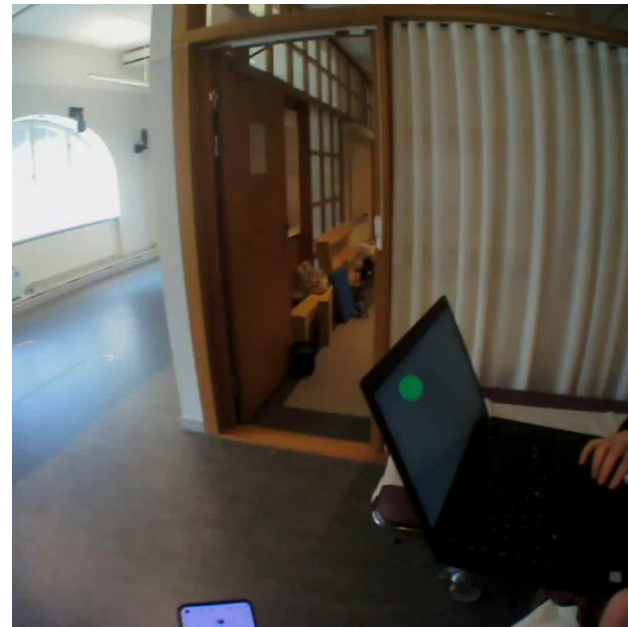
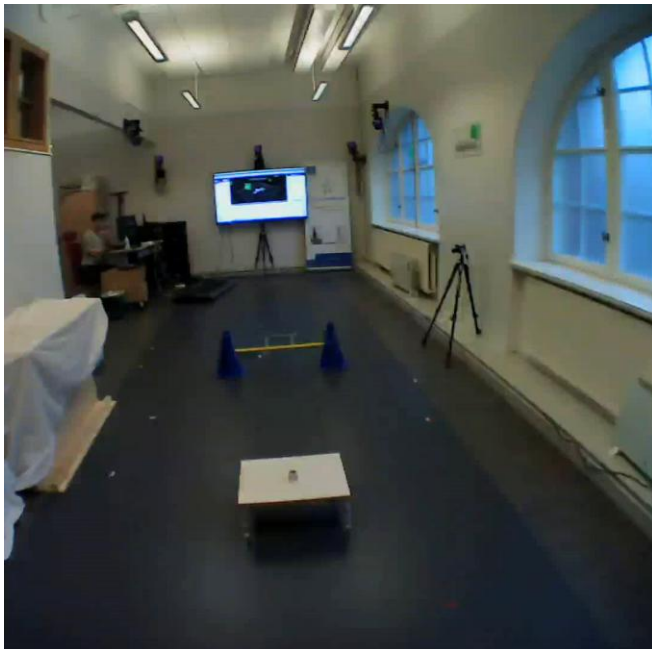
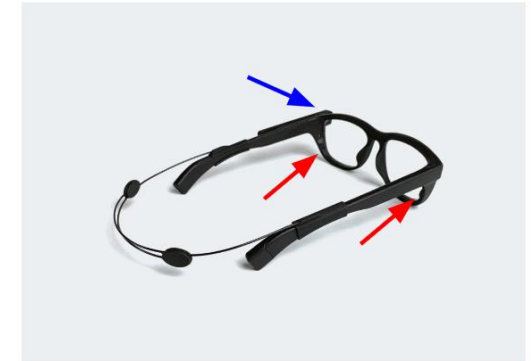
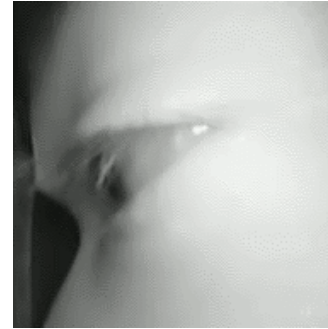
8 inertia
measurement units
(IMU)



Pressure
insole



Blink detection in gaze tracking



Courtesy to Sean Howart

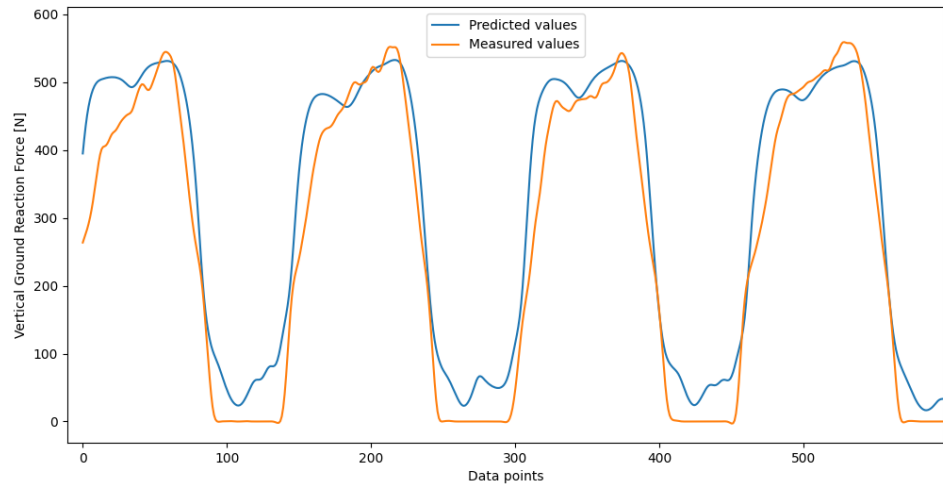
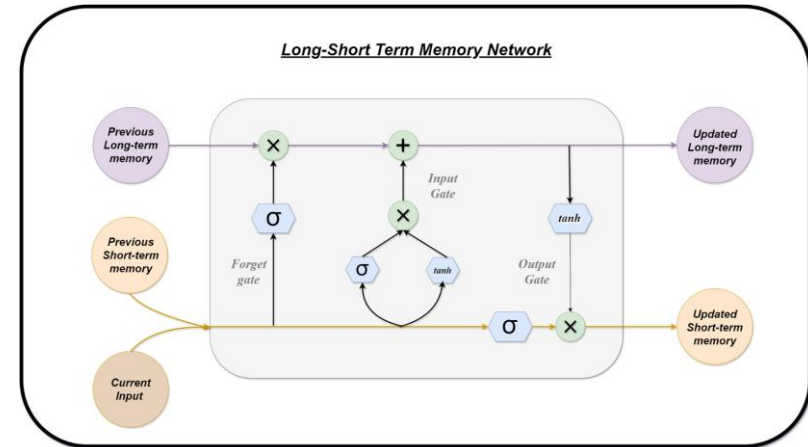
IMU-based Ground Reaction Force Estimation Using Machine Learning

8 inertia
measurement units
(IMU)



pressure
insoles

Courtesy to Malte Soric and Loke Nilsson





motorized ankle exoskeleton



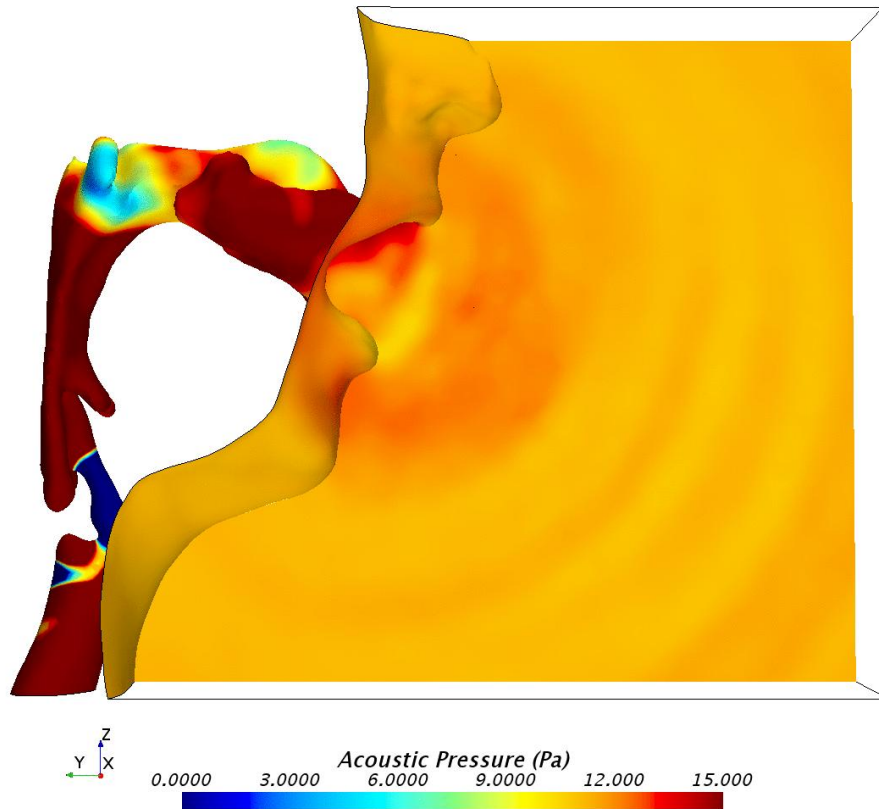
quasi-passive ankle
exoskeleton

Koncept för ett mjukt höftexoskelett för förbättrad mobilitet hos användare med rullator

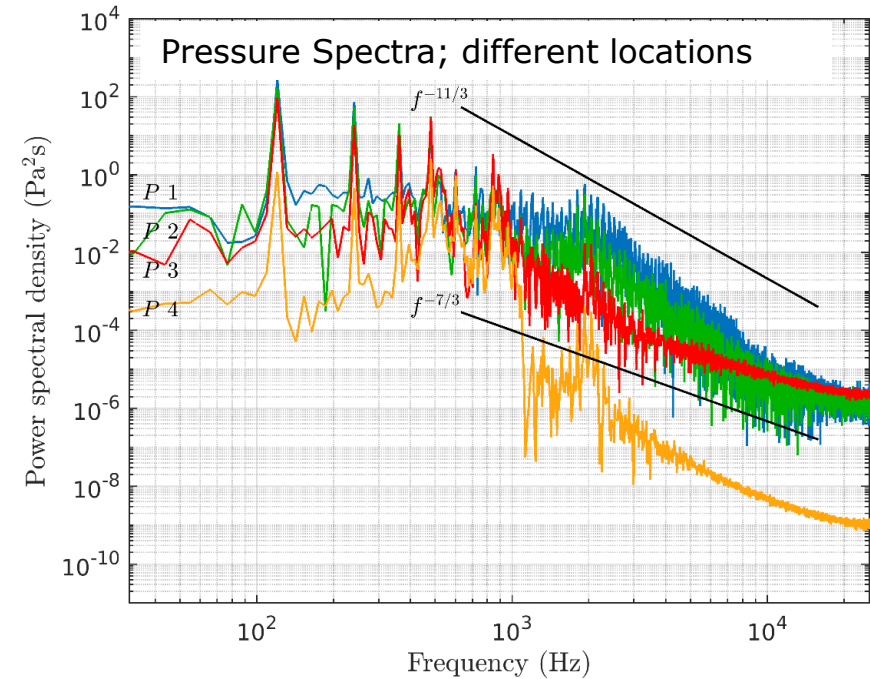


Courtesy to Camilla Kvarforth och Wilma Nilsson

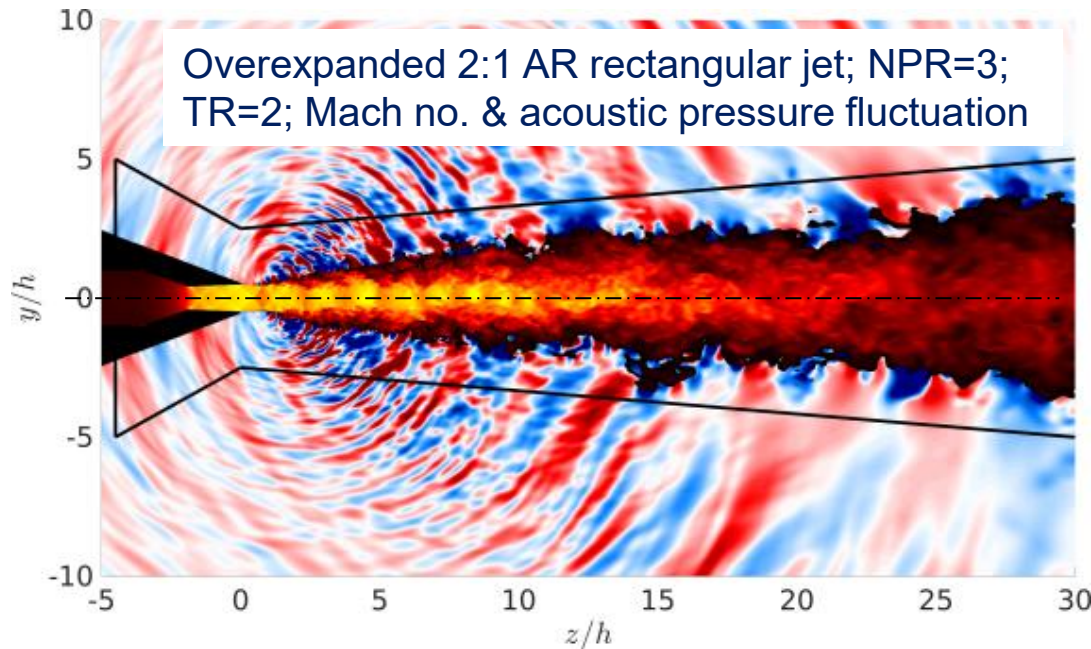
Batteri



Schickhofer, Malinen, and Mihaescu, (2019) *J. Acoustical Society of America* - JASA 145(3).



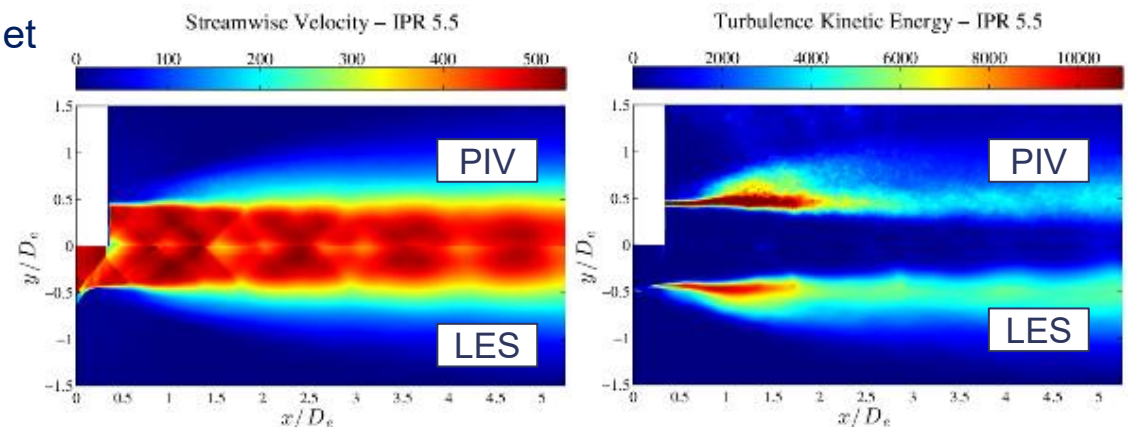
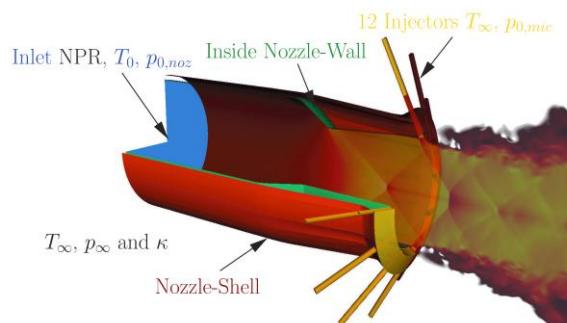
- Human voice production can be seen as a source-filter model
- The vocal folds act as a source, the vocal tract as an acoustic filter
- The position of formants in the frequency spectrum defines vowels and consonants



Focus Areas

- Efficient & more silent propulsion systems for aerospace applications
- Flow control for noise suppression technologies (e.g. fluidics, vortex generators).

Fluidic injection impact on the circular supersonic jet (NPR=4); Comparisons LES vs. PIV experiments



Gojon R., Gutmark E.J., Mihaescu M. (2017). On the response of a rectangular supersonic jet to a near-field located parallel flat plate. AIAA Technical Paper, AIAA 2017-3018. <https://doi.org/10.2514/6.2017-3018>

More information (ruoli@kth.se)

Web with description of project topics:

<https://www.kth.se/social/group/kex-jobb-examensarbe/>

Kandidatexamensarbete vid
Institutionen för Mekanik (15
hp)

en [KTH / Group web / Kandidatexamensarbete vid Institutionen för Mekanik \(15 hp\) / Tidig](#)

[Change descri](#)

Tidigare år KEX-projekt

Fluid Mechanics

Study of Particle Dynamics, Pair Dispersion, and Clustering of Floaters in Gravity-Capillary Wave Turbulence (<https://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-365872>)

Rocket Engine Oxidizer Valve Flow Dynamics (<https://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-365968>)

Finding an Empirical Model for a Rocket's Drag Coefficients (<https://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-349721>)

Numerisk studie av flödesregimer i roterande Couetteströmningar (<https://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-330809>)

Numerical simulations of solute transport in microchannels impregnated with a biofilm (<https://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-330869>)

Computational Fluid Dynamics of the flow in a diffuser: - like geometry (<https://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-330873>)

Analys av hög anticyklonisk rotation i plan couetteflöde genom direkt numerisk simulering (<https://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-348465>)

Biomechanics

Torque Validation of a Single-Joint Ankle Dynamometer (<https://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-366263>)

Blink detection in eye tracking (<https://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-330867>)

Gait analysis using machine learning: An implementation of temporal convolution networks on gait events and gait phase (<https://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-330867>)

Other projects:

- Wing simulation: [Ricardo Vinuesa, Philipp Schlatter](#)
- Shock hitting water droplet (stor fil): [Michael Liverts](#)
- Real-time motion tracking and musculoskeletal modeling : [Ruoli Wang](#)
- Real-time control of exoskeleton: [Lanie Gutierrez-Farewik](#)
- Compressor and EGR: [Mihai Mihaescu](#)
- Hairy surfaces: [Sherwin Bagheri](#)

Preliminary Local Group Meetings, Osquars Backe 18

- Kickoff and Project planning: beginning of Feb
- Mid-term follow up: Early April
- Presentation Rehearsal: Early May



Access to the common
area in Osquars Backe
18



Promobilia
MoveAbility Lab

Thank you for your attention!