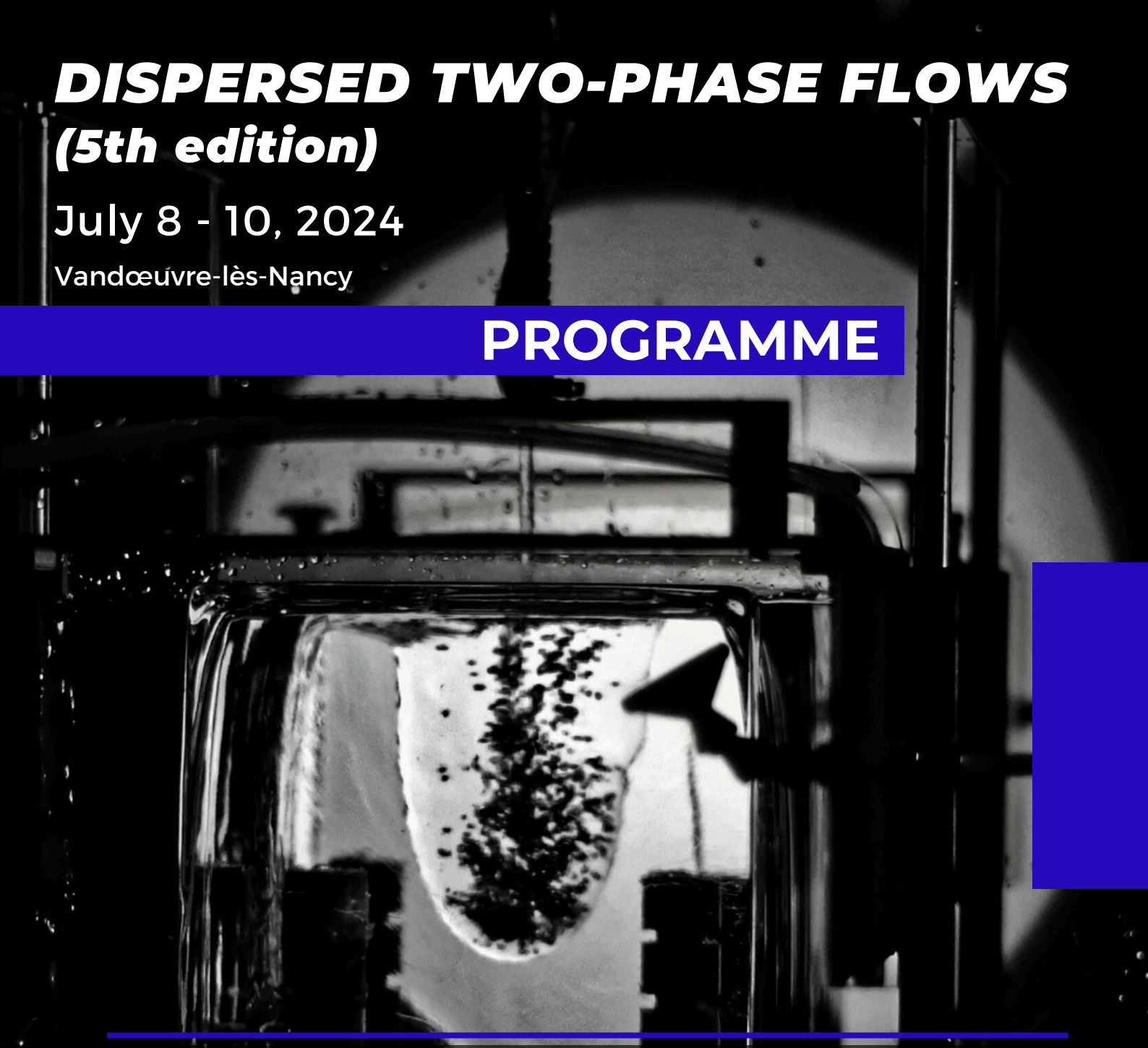
DISPERSED TWO-PHASE FLOWS
(5th edition)

July 8 - 10, 2024

Vandœuvre-lès-Nancy

PROGRAMME



The objective of the conference is to bring together researchers from different communities (academics and researchers from industrial research institutes in fluid mechanics, chemical engineering, ...) working on fundamental problems involving dispersed flows.

Organised by : Société Hydrotechnique de France
Event coordinators : Nicolas Rimbert (LEMTA) and Véronique Roig (IMFT)
Local Organizing Committee (LEMTA - CNRS/Université de Lorraine)

- *Monday evening: Visit of experimental facilities of LEMTA ► website*
- *Tuesday evening: Gala Dinner at Brasserie Excelsior Nancy ► website*

ENSEM - 2 avenue de la Forêt de Haye - 54500 Vandœuvre-lès-Nancy

Objectives

The objective of the conference is to bring together researchers from different communities (academics and researchers from industrial research institutes in fluid mechanics, chemical engineering, ...) working on fundamental problems involving dispersed flows.

Event presentation

In many industrial or environmental situations, particles, drops or bubbles are dispersed in a carrier fluid. Understanding and modeling dispersed flows is therefore a major issue for many applications including chemical engineering (bubble columns, water treatment, fluidized beds, oil refining), nuclear industry (boiling in steam generators, containment spray systems), environmental engineering (sediment transport, coastal erosion, river restauration), geophysics (volcanic processes, fluid migration in sedimentary basins), astrophysics (protoplanetary dust, planet formation) and combustion applications (atomization, spray combustion).

Experimental, numerical and theoretical studies will be presented on the following topics :

- Dynamics and transfer around isolated particles
- Interfacial dynamics (deformation, coalescence and rupture)
- Hydrodynamics of dispersed flows (turbulence, dispersion, two-way coupling)
- Mixing, transfers and phase-change in dispersed flows
- Transport in dispersed flows at high volume fraction
- Complex dispersed flows: density/viscosity stratification, granular & non-Newtonian flows
- Development of experimental methods
- Development of numerical methods
- Multiscale, multiphysics modeling
- Deep-learning and multiphase flow

Keynote Conferences

Pr Markus Uhlmann (Karlsruhe Institute of Technology - Germany)
Pr Filippo Coletti (ETH Zurich - Switzerland)
Dr Konstantin Mikityuk (Paul Scherrer Institute, Villigen - Switzerland)
Dr Pascal Fede (IMFT, CNRS/Toulouse INP/Université Toulouse III – Paul Sabatier)
Dr Romain Volk (Laboratoire de Physique, CNRS/ENS Lyon - France)

Scientific & Technical Committee

Agathe Chouippe (ICUBE, CNRS/Université de Strasbourg/INSA/ENGEES)
Aurore Naso (LMFA, École Centrale de Lyon/CNRS/Université Claude Bernard Lyon 1)
Christian Marchioli (University of Udine, Italy)
Daniel Fuster (Institut Jean Le Rond d'Alembert, Sorbonne Université/CNRS)
Denis Funfschilling (ICUBE, CNRS/Université de Strasbourg/INSA/ENGEES)
Diether Bothe (Technische Universität Darmstadt, Germany)
Emmanuel Porcheron (IRSN, Saclay)
Éric Lajeunesse (Institut de Physique du Globe de Paris, Université Paris Cité/CNRS)
Fabien Candellier (IUSTI, CNRS/Aix-Marseille Université)
Gauthier Verhille (IRPHE, Aix-Marseille Université/CNRS/École Centrale Marseille)
Guillaume Bois (CEA Saclay)
Hui-Zhi Li (LRGP, CNRS/Université de Lorraine)
Javier Ruiz-Rus (University of Jaen, Spain)
Jean Philippe Matas (LMFA, École Centrale de Lyon/CNRS/Université Claude Bernard Lyon 1)
Jean Sébastien Kroll-Rabotin (Institut Jean Lamour, CNRS/Université de Lorrain)
Jean-Régis Angilella (ABTE, Normandie Université)
Mathieu Guingo (EDF, Chatou)
Mickaël Bourgoin (Laboratoire de Physique, CNRS/ENS Lyon)
Nathalie Seiler (CEA Cadarache)
Nathanaël Machicoane (LEGI, CNRS/Grenoble INP, Université Grenoble-Alpes)
Panagiota Angeli (University College London)
Rainier Hreiz (LRGP, CNRS/Université de Lorraine)
Sander Huisman (University of Twente, Netherlands)
Stéphane Mimouni (EDF, Chatou)
Véronique Roig (IMFT, CNRS/Toulouse INP/Université Toulouse III – Paul Sabatier)
Yan Delaure (Dublin City University, Ireland)

Find out more : www.shf-hydro.org/colloques/dispersed-two-phase-flows/

Monday July 8th

8h00 - 9h00			**Registration**
9h00 - 10h00	**Markus Ulhmann**	**Karlsruhe Institute of Technology**	**Finite-size particles in incompressible and compressible flows**
10h15 - 10h45	Y. Ling	University of South Carolina	A data-driven lagrangian drop model to predict time-dependent shape deformation and drag using a narx neural network
10h45 - 11h15	T. Lasseur	EDF	Exploring single and two-phase flow-accelerated corrosion (fac) through computational fluid dynamics (cfd) analysis
11h15 - 11h45	A. Fayet	CEA	Assessment of neptune_cfd for two-phase flow in an irradiation capsule
11h45 - 12h15	A. Doradoux	NAVAL-GROUP/SIREHNA	Numerical simulation of the water-filling of a cylinder: a benchmark comparison
12h15 - 13h45			**Lunch**
13h45 - 14h45	**Pascal Fede**	**IMFT**	**Short and Long-range inter-particle interactions in particle laden turbulent flows**
15h00 - 15h30	A. Hakkoum	Gustave Eiffel/MSME	Towards particle-resolved direct numerical simulations of catalytic particulate flows: dry reforming of methane for hydrogen production
15h30 - 16h00	J.S. Kroll-Rabotin	IJL	Aggregate restructuring and breakage at finite reynolds numbers
16h00 - 16h30	D. Letessier	IMFT	Dynamics of a group of cylinders falling in a liquid at rest
16h30 - 17h00	E. Izard	ArcelorMittal	Instantaneous, local solid volume fraction on surfaces of a rectangular steel bloom immersed in a gas-solid fluidized bed
17h00-17h30	F. Beltran	EDF	Numerical and experimental study to characterize two-phase flow-induced vibration of a single cylinder in a confined channel
17h30 - 18h00			**Visit of experimental facilities of LEMTA**

Tuesday July 9th

9h00 - 10h00	**Filippo Coletti**	**ETH Zurich**	**Particles floating on turbulent water**
10h15 - 10h45	C. Rigal	ICUBE	Pore-scale study of the dynamics of a suspension of solid particles in porous media
10h45 - 11h15	M. Ungarish	Technion	The taylor column and drag force on a rising sphere in a rotating fluid
11h15 - 11h45	F. Brochard	IJL/APREX	From dust in plasmas to industry 4.0: a look back at a successful technology transfer in video processing
11h45 - 12h15	V. Boniou	IFPEN	Collision statistics of finite-size droplets in turbulent emulsions from dns
12h15 - 13h45			**Lunch**
13h45 - 14h45	**Romain Volk**	**Laboratoire de Physique**	**Mixing and unmixing of phoretic particles in chemically induced compressible flows**
15h00 - 15h30	C. Tang	University College London	Double emulsion formation in microchannels using surfacants
15h30 - 16h00	L. Chagot	University College London	Impact of microchannel geometry on surfactant-laden droplet size: experimental analysis to data-driven predictions
16h00 - 16h30	M. Crialesi-Esposito	University of Modena and Reggio Emilia	How small droplets form in turbulent multiphase flows
16h30 - 17h00	N. Fintzi	IFPEN	Theoretical calculation of the droplet induced agitation (or pseudoturbulence) in buoyant emulsions in the low inertia and dilute regimes
17h00 - 17h30	B. Qaddah	IRT M2P	Modelling of the eiga (electrode induced gas atomization) process
17h30 - 18h00	T. Potaufeux	LEMTA	Experimental study of heat dissipation produced by drop impact on textured surfaces
20h			**Gala dinner**

Brasserie Excelsior
50 rue Henri Poincaré - Nancy

Wednesday July 10th

9h00 - 10h00	**Konstantin Mikityuk**	**Paul Scherrer Institute**	**Safety-related thermal-hydraulic experiments in ESFR-SMART project**
10h15 - 10h45	F. Arlotti	CEA	Application of upscaling method on subchannel psbt experiment, a first step towards validation of cathare3 under heterogeneous boiling conditions
10h45 - 11h15	C. Loiseau	EDF	Experimental and numerical modelling of boiling flows in microcracks
11h15 - 11h45	A. Djermoune	LEMTA	Experimental study of the effect of roughness on the ablation of a solid wall by a liquid jet
11h45 - 12h15	M. Leroy	LEMTA	Micro-encapsulated phase change materials suspension for heat and mass transfer: a thermo-physical characterization
12h15 - 14h00			**Lunch**
14h00 - 14h30	S. Mimouni	EDF	Validation of neptune_cfd for debora experiments
14h30 - 15h00	N. Dev	LMFA	Air entrainment in bubble clouds generated by plunging jets
15h00 - 15h30	P. Schleuniger	CORIA	3d measurement of the position of free-rising bubbles with a single plenoptic camera
15h30 - 16h00	A. Ramos Perez	Paul Scherrer Institute	Visualization and characterization of multiphase particle mass transfer for non-ideal gas-liquid bubbles
16h00 - 16h30	V. Roig	IMFT	Impact of confinement on mass transfer and transport of oxygen around inertial bubbles
16H30 - 17h00	E. Belut	INRS	Numerical study of the capture of aerosol particles by falling deformable droplets

Abstracts of keynote conferences

Markus Uhlmann | Finite-size particles in incompressible and compressible flows

Particulate flows are often encountered in natural and technical systems, such as in the form of hydrometeors in the atmosphere, sediment in surface waters or particulate matter in chemical processing plants. The motion of inertial particles does not follow fluid pathlines in complex flows, often leading to non-trivial spatial arrangements of the solid phase which can be observed as voids and clusters. The spatial distribution in turn has important effects on many global quantities of interest such as the average particle settling velocity. Despite intensive research there still remain fundamental open questions concerning the precise nature of the mechanisms at play and their description with the aid of reduced order models. When the particles have a finite size (i.e. their size is not small compared to the smallest flow scales and/or the particle Reynolds number is not small) the parameter space becomes larger, the number of available data-sets is smaller, and a theoretical description becomes more challenging. In this context particle-resolved simulations (PR-DNS) have provided an important source of information for the community. In the present contribution we are going to discuss two configurations: particle dynamics in forced homogeneous-isotropic turbulence (HIT) on the one hand, and compressible flow interacting with a swarm of particles on the other.

Pascal Fede | Short and Long-range inter-particle interactions in particle laden turbulent flows

Turbulent particle-laden flows are found in a wide range application as: powder transport (pneumatic conveying, silo discharge), pharmaceutical and medical applications (drug inhalation, virus dispersion by sneezing), space exploration (landing on Mars), renewable energy (dust deposition on photovoltaic panel, scouring around off-shore wind turbine pile) or geophysical flows (dune motion, volcano ashes dispersion, sediment transport). In all of these applications, many complex phenomena take place: particle dispersion, collision/bouncing, attrition/abrasion, electrostatic forces, chemical reaction etc. Among all of these, the inter-particle interactions may play an important role on the particle turbulent dispersion or on the spatial distribution. In this talk, we discuss about the competition between the particle interaction with the turbulence and the collisions (short-range interaction) or electrostatic forces (long-range interaction).

FIlippo Coletti | Particles floating on turbulent water

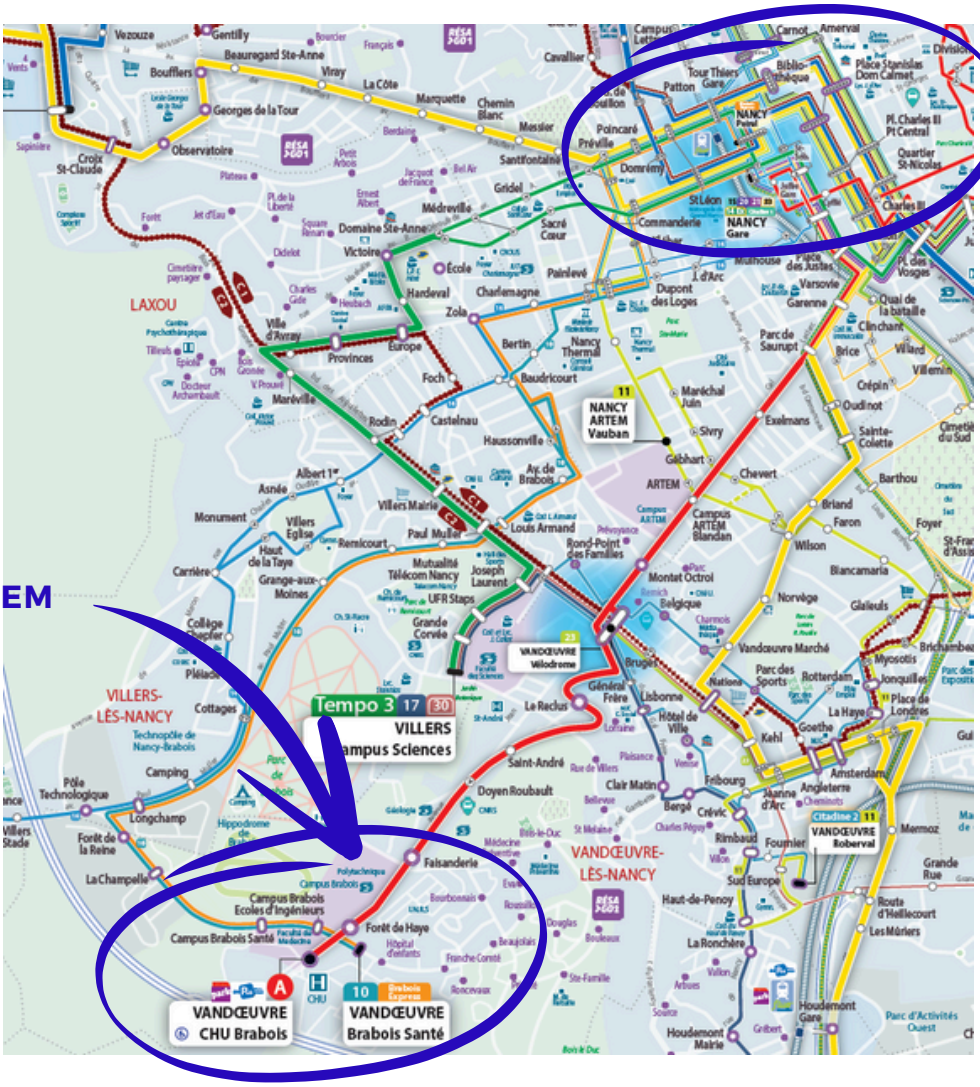
Every year, millions of tons of plastics enter the ocean. Devising effective strategies to mitigate such pollution requires the quantitative understanding of how floating particles travel and spread in turbulent waters. Past studies have mostly focused on the influence exerted by the surface on the flow underneath, while the characterization of the transport along the surface remains incomplete. I will summarize our recent experiments using laboratory and field-scale facilities. Microscopic particles faithfully follow the free surface flow, revealing a rich structure that shares similarities with both three-dimensional and two-dimensional turbulence, as well as unique features. In particular, due to the compressibility of the surface velocity field, the particles cluster over a wide range of spatial and temporal scales. For millimetre-sized particles, capillarity-driven attraction breaks the equilibrium between cluster formation and breakup, leading to aggregates that grow steadily in size. Even larger particles filter the small-scale velocity fluctuations, which results in a more time-correlated motion and, in turn, faster dispersion.

Romain Volk | Mixing and unmixing of phoretic particles in chemically induced compressible flows

The transport of colloidal particles by a flow can be greatly modified by the presence of salt or temperature gradients in the fluid, which may result in a small drift velocity between the particles and the flow that is proportionnal to the scalar gradient. Although this effect may be overlooked in a first place, it dramatically changes the topology of the flow of colloids which becomes compressible. As a consequence a tiny change in the flow can result in large modifications of the time needed to achieve mixing. In this presentation I will review phoretic effects due to temperature and concentration and draw a parallel with the transport of inertial particles in turbulent flows. In a second time I will explain how and why mixing of colloids can be strongly enhanced or delayed in chaotic mixers and show that transport may be blocked when compressibility is so strong that it leads to particle trapping.

Konstantin Mikityuk | Safety-related thermal-hydraulic experiments in ESFR-SMART project

This presentation will provide a concise history of the conceptual development of a large-power European Sodium Fast Reactor (ESFR). It will also review the primary research and development activities aimed at enhancing the safety of Generation-IV ESFRs, particularly those undertaken as part of the Horizon-2020 ESFR-SMART project. Special emphasis will be placed on the thermal-hydraulic safety-relevant experiments conducted by the project partners.



There are several ways to get to ENSEM from Nancy station:

- **Bus A** > direction Vandoeuvre CHU Brabois - get off at “Saint Sébastien” (2 minutes' walk from the station) and get off at “Forêt de Haye”

Journey time approx. 30-35 minutes with a bus every 7 minutes

- **Bus 10** > direction Vandoeuvre Brabois Santé - “Tour Thiers Gare” stop to “Campus Brabois, écoles d’ingénieurs” stop

Duration approx. 30 minutes, with a bus every 15-20 minutes

- **Brabois Express bus** : departure place de la République > direction Vandoeuvre Brabois Santé - to “Campus Brabois, écoles d’ingénieurs” stop.

The fastest solution (20 minutes), but only between 7am and 10am and 4pm and 7pm.

► **Website:** https://www.reseau-stan.com/