Information for
The 18th International Conference on Numerical Combustion

COVID-19 Protocols and Information

- We **strongly recommend that attendees**, regardless of vaccine status, wear a face mask unless they are presenting or eating.
- Face coverings are no longer required in San Diego County, however **masks are strongly recommended for all persons**, regardless of vaccine status:
  - In indoor public settings and businesses (e.g., retail, restaurants, theaters, family entertainment centers, meetings, state and local government offices serving the public);
  - On public transit (e.g., airplanes, ships, ferries, trains, subways, buses, taxis, and ride-shares); and
  - In transportation hubs (e.g., airport, bus terminal, marina, train station, seaport or other port, subway station, or any other area that provides transportation).
- For more local COVID-19 information, we refer you to the San Diego County Health Department's page: https://www.sandiegocounty.gov/content/sdc/hhsa/programs/phs/community_epidemiology/dc/2019-nCoV.html
- If you require a COVID-19 PCR test, there is an option within walking distance of the hotel:
  - UC San Diego La Jolla Walk Up: https://health.ucsd.edu/coronavirus/Pages/testing.aspx#options

San Diego Visitor Information

- The Blue Trolley Line is easily accessible from the Hotel and connects directly to a number of shopping and dining areas:
  - Old Town San Diego – https://oldtownsandiegoguide.com/
  - Gas Lamp Quarter – https://www.gaslamp.org/
  - San Diego Little Italy/County Center – https://www.sandiego.org/explore/downtown-urban/little-italy.aspx

- For more information about San Diego please visit the below sites:
  - Weather - https://www.sandiego.org/plan/weather.aspx
  - Things to do in San Diego – https://www.sandiego.org/explore/things-to-do.aspx
  - Things to do in California - https://www.visitcalifornia.com/places-to-visit/san-diego/

Monday Plenary Lecture

Prof. Petros Koumoutsakos, John A. Paulson School of Engineering and Applied Sciences, Harvard University

Artificial Intelligence for modeling prediction and control of fluid flows

Bio: Petros Koumoutsakos is Herbert S. Winokur, Jr. Professor of Engineering and Applied Sciences, Faculty Director of the Institute for Applied Computational Science (IACS) and Department Chair of Applied Mathematics at Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS). He studied Naval Architecture (Diploma-NTU of Athens, M.Eng.-U. of Michigan), Aeronautics and Applied Mathematics (PhD-Caltech) and has served as the Chair of Computational Science at ETH Zurich (1997-2020). Petros is elected Fellow of the American Society of Mechanical Engineers (ASME), the American Physical Society (APS), the Society of Industrial and Applied Mathematics (SIAM). He is recipient of the Advanced Investigator Award by the European Research Council and the ACM Gordon Bell prize in Supercomputing. He is elected International Member to the US National Academy of Engineering (NAE). His research interests are on the fundamentals and applications of computing and artificial intelligence to understand, predict and optimize fluid flows in engineering, nanotechnology, and medicine.

Abstract: Over the last last thirty years we have experienced more than a billion-fold increase in hardware capabilities and a dizzying pace of acquiring and transmitting massive amounts of data. Artificial Intelligence (AI) has been the beneficiaries of these advances and today it is increasingly embedded in technologies that touch every aspect of humanity. In this talk I would offer a perspective on forming alloys of AI and simulations for the prediction and control of complex flow systems. I will present novel algorithms for learning the Effective Dynamics (LED) of complex flows and a fusion of multi- agent reinforcement learning and scientific computing (SciMARL) for modeling and control of complex flow-structure interactions. I will juxtapose successes and failures and argue that the proper fusion of fluid mechanics knowledge and AI expertise is essential to advance scientific frontiers.

Tuesday Plenary Lecture

Dr. Andrea Gruber, SINTEF Energy Research, The Norwegian University of Science and Technology

A path to low-emission, on-demand, large-scale power generation and propulsion: Progress and challenges in carbon-free firing of gas turbines and the role of combustion research

Bio: Andrea Gruber holds a doctoral degree in Mechanical Engineering from NTNU (2006), he is Senior Research Scientist at SINTEF Energy Research and Adjunct Professor at NTNU. His research interests are in the development and application of massively parallel direct numerical simulations (DNS), a first-principle, high-fidelity numerical modelling approach, to achieve detailed insight and obtain accurate predictions of turbulent reactive flows. Dr. Gruber has performed DNS on some of the research challenges related to combustion of highly-reactive and non-standard fuels in gas turbines (hydrogen in particular). Pursuing industrial relevance within the framework of numerous national and international research initiatives (BIGH2, NCCS, DiHI-Tech, ENCAP, DECARBit) and in close partnership with the gas turbine industry (ALSTOM, Ansaldo Energia, Siemens Energy), he has contributed to the fundamental understanding of key turbulence-chemistry interaction processes that play a major role in the achievement of clean and efficient power generation: design and optimization of fuel injection systems, flashback prediction and control, static and dynamic flame stabilization in conventional and staged combustion systems.

Abstract: Efforts to curb emissions of greenhouse gases and atmospheric pollutants while meeting the stability requirements of modern energy systems at the needed scale will involve the use of low-carbon or carbon-free chemical energy carriers – e.g. syngas, methane, methanol, ammonia, hydrogen and their blends. The steady, constant-pressure combustion processes that characterize Brayton thermodynamic cycles have the best potential to handle fuels with very different heating value and seamlessly switch between fuel-oxidant mixtures of varying reactivity. Therefore, based on fundamental cycle characteristics and following opportune adaptations of their combustion system, modern gas turbines are intrinsically well-suited to satisfy future requirements for fuel flexibility while still ensuring fast-response, on-demand, large-scale power generation at high cycle efficiency with low-emissions. In this context, the development of advanced dry low emission (DLE) premixed combustion systems is a key enabling step and is proceeding principally along three directions of research, each providing more robust flame stabilization while minimizing undesired emissions: 1) advanced piloting strategies that improve upon “traditional” aerodynamic flame stabilization and propagation; 2) novel injection systems that implement a spatially-distributed fuel delivery and heat release process; and 3) hybrid flame stabilization strategies based on longitudinal/sequential fuel staging and reheat combustion systems controlled by spontaneous ignition. The performance of these alternative approaches to combustion systems design and their impact on the gas turbine operability remain to be comparatively assessed for a wide range of fuels. Therefore, numerical modeling of turbulent reactive flows will continue to play a crucial role in supporting the gas turbine industry and reducing the development cost of clean and efficient power generation and propulsion.

The 18th International Conference on Numerical Combustion

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18th International Conference on Numerical Combustion
Hyatt Regency in La Jolla, San Diego, CA
8 – 11 May 2022

Sunday, 8 May 2022

14:30 – 17:00 Registration: Regency Foyer
17:00 – 19:00 Welcome Reception: Poolside at the Hyatt Regency

Monday 9 May 2022

07:30 - 16:00 **Registration: Regency Foyer**
08:15 - 08:30 **Welcome Address** in Regency DEFG **Prof. Mitch Smooke, Yale University**
Welcome Remarks in Regency DEFG
Prof. Robert Continetti, Senior Associate Vice Chancellor, Academic Affairs, University of California – San Diego

08:30 - 09:30 **Plenary Lecture** in Regency DEFG**: Prof. Petros Koumoutsakos, Harvard University**
Title: *Artificial Intelligence for modeling prediction and control of fluid flows*
Session Chair: J.H. Chen, *Sandia National Laboratories*

Mini Symposium indicated by MS

09:30 - 09:40	**Morning Announcements** in Regency DEFG: **Prof. Kalyanasundaram Seshadri, University of California – San Diego** **Transition to Morning Sessions** **The organizers would like to thank our sponsors for their generous donations:** Solar Turbines Convergent Science FM Global				
	Laminar Flames I **Regency AB** **Session Chair:** **M. Smooke**	**Droplets, Spray, & Heterogeneous Combustion I** **Regency C** **Session Chair: C. Groth**	**Numerical Methods I** **Del Mar 1 & 2** **Session Chair:** **M. Day**	**LES Data Driven Models I** **Encinitas 1 & 2** **Session Chair:** **M. Ihme**	**Sustainable Aviation Fuels** **Regency DEFG** **MS by S. Yellapantula**
09:40 - 10:00	**1A01: Thermo-diffusive instabilities in laminar flames of hydrogen/methane blends** *A. Attili[1], S. Wilks[1], P. Lapenna[2], F. Creta[2], L. Berger[3], H. Pitsch[3]* *[1]University of Edinburgh* *[2]Università di Roma, La Sapienza* *[3]RWTH Aachen University*	**1B01: Vapor-Liquid Equilibrium (VLE)-based CFD simulation and investigation of shock-droplet interaction** *H. Zhang, S. Yang* *University of Minnesota Twin Cities*	**1C01: LES of under-expanded H2 jets for engine applications** *A. Ballatore, J. van Oijen* *Eindhoven University of Technology*	**1D01: Data-assisted combustion modeling in LES of a laser-ignited GCH4/GOX rocket** *W.T. Chung, M. Ihme* *Stanford University*	**1E01MS: Sustainable aviation fuel certification and the opportunity for numerical simulations to help decarbonize commercial aviation** *S. Yellapantula* *National Renewable Energy Laboratory*

	Laminar Flames I Regency AB Session Chair: M. Smooke	Droplets, Spray, & Heterogeneous Combustion I Regency C Session Chair: C. Groth	Numerical Methods I Del Mar 1 & 2 Session Chair: M. Day	LES Data Driven Models I Encinitas 1 & 2 Session Chair: M. Ihme	Sustainable Aviation Fuels Regency DEFG MS by S. Yellapantula
10:00 - 10:20	**1A02: Quasi-planar lean hydrogen-air premixed flames in narrow channels** *A. Domínguez-González[1], D. Martínez-Ruiz[1], M. Sánchez Sanz[2]* *[1]Universidad Politécnica de Madrid* *[2]Universidad Carlos III de Madrid*	**1B02: A modelling strategy for mass and heat transfer of multi-component droplets** *A. Carvalho Santos[1], F.L. Sacomano Filho[2], A. Vié[1]* *[1]Université Paris-Saclay* *[2]Universidade de São Paulo*	**1C02: Super-grid linear eddy model as chemical closure for turbulent combustion** *A.M. Menon[1], A.R. Kerstein[2], M. Oevermann[3]* *[1]Chalmers University of Technology* *[2]Independent researcher and consultant* *[3]BTU Cottbus-Senftenberg*	**1D02: Characterizing manifold topologies for reduced-order modeling** *K. Zdybał[1], M. Rafi Malik[2], E. Armstrong[3], J.C. Sutherland[3], H.G. Im[2], A. Parente[1]* *[1]Université Libre de Bruxelles* *[2]King Abdullah University of Science and Technology* *[3]University of Utah*	**1E02MS: Role of simulations in accelerating adoption of Sustainable Aviation Fuels** *M.S. Anand* *Rolls-Royce Corporation*
10:20 - 10:40	**1A03: Combustion of ultra-lean hydrogen-air mixtures in a small-scale heat-recirculating burner: Comparison of complete and reduced kinetics** *D. Fernández-Galisteo[1], C. Jiménez[1], V.N. Kurdyumov[1], A.L. Sánchez[2]* *[1]CIEMAT* *[2]University of California San Diego*			**1D03: A-posteriori investigations of a super-resolution data-driven model for large eddy simulation** *L. Nista[1], T. Grenga[1], A. Attili[2], P. Petkov[3], V. Pavlov[3], S. Markov[3], H. Pitsch[1]* *[1]RWTH Aachen University* *[2]University of Edinburgh* *[3]National Centre for Supercomputing Applications, Bulgaria*	**1E03MS: HyChem approach to modeling combustion chemistry of sustainable aviation fuels** *H. Wang* *Stanford University*
10:40 - 11:00	**BREAK – Regency Foyer**				
	Premixed LES I Regency AB Session Chair: T. Gallagher	**Plasma-Assisted Ignition Regency C Session Chair: S. Yang**	**Detonations, Explosions, & Supersonic Combustion I Del Mar 1 & 2 Session Chair: E.S. Oran**	**Data-Driven Modeling for Turbulent Combustion Encinitas 1 & 2 MS by C. Huang & K. Duraisamy**	**Sustainable Aviation Fuels Regency DEFG MS by S. Yellapantula**
11:00 - 11:20	**1A04: Assessment of subfilter-scale turbulence-radiation interaction using stochastic time and space series** *G. Fraga, X. Zhao* *University of Connecticut*	**1B04: DNS and LES of plasma assisted ignition with a phenomenological model using low-Mach and fully-compressible reacting flow solvers** *T.S. Taneja, S. Yang* *University of Minnesota Twin Cities*	**1C04: Preliminary investigations of the detonation-bow shock interaction** *A.S. Venkataraman, E.S. Oran* *Texas A&M University*	**1D04MS: Data assimilation for turbulent combustion: Concepts, opportunities and challenges** *M. Ihme, D. Brouzet, G. Vignat* *Stanford University*	**1E04MS: Fuel-sensitive computational modeling of emissions and turbulent combustion to enable sustainable aviation fuels** *M. Mueller* *Princeton University*

	Premixed LES I Regency AB Session Chair: T. Gallagher	Plasma-Assisted Ignition Regency C Session Chair: S. Yang	Detonations, Explosions, & Supersonic Combustion I Del Mar 1 & 2 Session Chair: E.S. Oran	Data-Driven Modeling for Turbulent Combustion Encinitas 1 & 2 MS by C. Huang & K. Duraisamy	Sustainable Aviation Fuels Regency DEFG MS by S. Yellapantula
11:20 - 11:40	**1A05: A first-order maximum-entropy-inspired interpolative closure for radiative heat transfer in non-gray participating media** *J. Sarr, C. Groth* *University of Toronto*	**1B05: Plasma-assisted ignition using an equivalent circuit model** *T. Hazenberg, J. van Dijk, J.A. van Oijen* *Eindhoven University of Technology*	**1C05: The effect of reaction kinetics on a diffracting detonation in a two-dimensional circular arc geometry** *M. Short, C. Chiquete, S.J. Voelkel* *Los Alamos National Laboratory*	**1D05MS: Data assimilation for computational modeling of reacting flows** *X. Gao, Y. Wang* *Colorado State University*	**1E05MS: Liquid fuel injection challenges and opportunities** *M. Ihme* *Stanford University*
11:40 - 12:00	**1A06: Direct moment closure approach for turbulent combustion** *R. Liu, K. Luo, J. Yang, Y. Bai, J. Fan* *Zhejiang University*	**1B06: Numerical simulations of plasma-assisted ignition in flowing environments** *Y. Bechane, B. Fiorina* *Université Paris-Saclay, CNRS*	**1C06: Predicting detonation initiation from planar finite pulse impacts** *V. Schuetz, D.S. Stewart* *University of Florida*	**1D06MS: Progress in projection-based model order reduction of turbulent combustion** *C. Huang[1], K. Duraisamy[2]* *[1]University of Kansas* *[2]University of Michigan*	**1E06MS: A statistical approach for modeling and understanding high- altitude engine relight** *V. Raman, Y. Tang, M. Hassanaly, S. Barwey* *University of Michigan*
12:00 - 12:20			**1C07: Numerical simulations on detonation development in hydrogen/ammonia mixtures under engine-relevant conditions** *J. Zhang, M.B. Luong, H.G. Im* *King Abdullah University of Science and Technology*	**1D07MS: On-the-fly reduced order modeling of turbulent combustion with time-dependent subspace** *H. Babaee[1], A. Aitzhan[1], A.G. Nouri[1], D. Ramezanian[2], P. Givi[1]* *[1]University of Pittsburgh* *[2]Univeristy of Southern California*	**1E07MS: Thermoacoustic instability modeling and challenges for SAF combustion** *V. Acharya* *Georgia Institute of Technology*
12:20 - 13:40	**LUNCH – La Jolla Ballroom** **The organizers would like to thank our sponsors for their generous donations:** Solar Turbines Convergent Science FM Global				

	Non-premixed LES Regency AB Session Chair: G. Blanquart	Droplets, Spray, & Heterogeneous Combustion II Regency C Session Chair: J. Sutherland	Gas Turbines, Piston Engines, & Stationary Combustion Systems I Del Mar 1 & 2 Session Chair: A. Gruber	Reduced Order Modeling for Simulations with Complex Kinetics Encinitas 1 & 2 Session Chair: T. Echekki
13:40 - 14:00	**1A08: Simulations of combustion chamber outflow configurations for a hybrid rocket motor** *A.T. Carroll[1], C. Dhandapani[1], G. Blanquart[1], J. Rabinovitch[2]* *[1]California Institute of Technology* *[2]Stevens Institute of Technology*	**1B08: A parametric study of MILD coal combustion from high-fidelity simulations** *H. Zhou, J. Sutherland* *The University of Utah*	**1C08: Numerical modeling of heat-recirculating combustors: Geometrical and chemical effects** *P. Bhuripanyo, P. Ronney* *University of Southern California*	**1D08: PCA-based cell agglomeration for simulation of turbulent flames with detailed kinetics** *A. Cuoci[1], T. Grenga[2], H. Pitsch[2]* *[1]Politecnico di Milano* *[2]RWTH Aachen University*
14:00 - 14:20	**1A09: Sample-partitioning adaptive reduced chemistry for large eddy simulations of turbulent flames** *R. Amaduzzi, P. Pagani, G. D'Alessio, R.M. Galassi, A. Parente* *Université libre de Bruxelles*	**1B09: Molecular dynamics investigation of the oxidation of iron-based nanofuels for next generation low-carbon engines** *E. Kritikos, A. Giusti* *Imperial College London*	**1C09: Numerical analysis of fuel injection and mixture formation in a piston engine** *T. Wegmann, M. Meinke, W. Schröder* *RWTH Aachen University*	**1D09: Coupling of novel probabilistic transfer learning strategies and autoencoders to expedite DNS of reactive flows** *B.S. Soriano[1], M. Rieth[1], M. Khalil[1], T. Echekki[2], J. Chen[3]* *[1]Sandia National Laboratories* *[2]NC State University* *[3]Sandia National Laboratories*
14:20 - 14:40	**1A10: Virtual chemistry in multi-regime combustion; application to soot prediction in laminar and turbulent flames** *H. Maldonado Colmán[1], A. Cuoci[2], D. Veynante[1], N. Darabiha[1], B. Fiorina[1]* *[1]Université Paris-Saclay, CNRS* *[2]Politecnico di Milano*	**1B10: Effect of particle size distribution on the flame speed of iron aerosols** *A. Ravi, P. de Goey, J. van Oijen* *Eindhoven University of Technology*	**1C10: Numerical review on the choice of models for the prediction of cyclical flow-field variations in IC engines** *L. Engelmann[1], C. Welch[2], D. Meller[3], Benjamin Böhm[2], A. Kempf[1]* *[1]University Duisburg-Essen* *[2]Technische Universität Darmstadt* *[3]Institute for Combustion and Gasdynamic (IVG)*	**1D10: Acceleration of turbulent combustion DNS via principal component transport and machine learning** *A. Kumar[1], M. Rieth[2], O. Owoyele[3], J. Chen[2], T. Echekki[1]* *[1]North Carolina State University* *[2]Sandia National Laboratories* *[3]Louisiana State University*
14:40 - 15:00	**1A11: Large eddy simulations of turbulent non-premixed ammonia/hydrogen jet flames at elevated pressure using flamelet-progress variable and principal component analysis** *S. Abdelwahid, M. Rafi Malik, F.E. Hernández Pérez, H.G. Im* *King Abdullah University of Science and Technology*	**1B11: The impact of higher oxides on iron dust combustion** *C.E.A.G. van Gool, L.C. Thijs, W.J.S. Ramaekers, J.A. van Oijen, L.P.H. de Goey* *Eindhoven University of Technology*	**1C11: DNS of premixed jet flame in a crossflow at engine relevant conditions** *H. Tummalapalli[1], E, Hawkes[2], H. Ranadive[1], A. Wehrfritz[1]* *[1]The University of New South Wales* *[2]UNSW Australia*	**1D11: Adjusted sparse sensing-based digital twins of combustion systems via data assimilation** *L. Donato, A. Procacci, A. Coussement, A. Parente* *Université Libre de Bruxelles*

	Non-premixed LES Regency AB Session Chair: G. Blanquart	Droplets, Spray, & Heterogeneous Combustion II Regency C Session Chair: J. Sutherland	Gas Turbines, Piston Engines, & Stationary Combustion Systems I Del Mar 1 & 2 Session Chair: A. Gruber	Reduced Order Modeling for Simulations with Complex Kinetics Encinitas 1 & 2 Session Chair: T. Echekki
15:00 - 15:20	**1A12: Importance of inter-flamelet mixing in multiple representative interactive flamelets models** *M. Davidovic, H. Pitsch* *RWTH Aachen University*	**1B12: Mesoscale numerical modeling of melt-layer combustion of metalized solid fuels** *S.Y. Han, H.-S. Choi, J.J. Yoh* *Seoul National University*	**1C12: DNS study on knocking initiation induced by acoustic waves interacting with tulip-like flame** *Y. Morii[1], A. Dubey[2], H. Nakamura[1], K. Maruta[1]* *[1]Tohoku University* *[2]Indian Institute of Technology Roorkee*	**1D12: A new index for a posteriori evaluation of local PCA data partition** *M. Savarese, A. Ozden, A. Parente* *Université Libre de Bruxelles*
15:20 - 16:00	**BREAK – Regency Foyer**			
	Combustion Dynamics & Instabilities I Regency AB Session Chair: A. Scholtissek	**Emissions & Pollutants I Regency C Session Chair: H. Wang**	**Detonations, Explosions, & Supersonic Combustion II Del Mar 1 & 2 Session Chair: M. Short**	**Fires Encinitas 1 & 2 Session Chair: A. Stagni**
16:00 - 16:20	**1A14: Effects of pitch angle and momentum ratio on flame stabilization in opposed jets in crossflow** *V. Sharma[1], Y. Tang[2], V. Raman[1]* *[1]University of Michigan* *[2]ANSYS, Inc.*	**1B14: Soot reduction effect of oxymethylene ether addition in laminar premixed ethylene flames** *R. Schmitz[1], F. Ferraro[1], C. Hasse[1], M. Sirignano[2]* *[1]Technische Universität Darmstadt* *[2]Università degli Studi di Napoli Federico II*	**1C14: Manifold-based modeling for nonpremixed supersonic turbulent combustion** *E. Cisneros-Garibay, M.E. Mueller* *Princeton University*	**1D14: A numerical study of the length-scale dependence of pool fire behavior using large eddy simulation** *J. McConnell, J. Hewson* *Sandia National Laboratories*
16:20 - 16:40	**1A15: A Lattice-Boltzmann study of premixed flames thermoacoustic instabilities** *K. Bhairapurada, B. Denet, P. Boivin* *Aix Marseille Univ, CNRS*	**1B15: Comparative assessment of fractional-order univariate and bivariate quadrature-based moment closures for predicting soot production in laminar flames** *J.Y. Xing[1], C.P.T. Groth[1], F. Laurent[2], B. Franzelli[2]* *[1]University of Toronto* *[2]Laboratoire EM2C, CNRS*	**1C15: Structure and dynamics of 2D and 3D detonations in ethylene-air mixtures** *A.Y. Poludnenko[2], S.S. Dammati[1], C. Colby[2]* *[1]Texas A&M University* *[2]University of Connecticut*	**1D15: Zonal-based emission source term model for wildfire simulations** *A. Josephson[1], R. Linn[2], B. Gullet[2], J. Aurell[1]* *[1]Los Alamos National Laboratory* *[2]Environmental Protection Agency*
16:40 - 17:00	**1A16: Flame stabilization mechanisms of a technically premixed hydrogen flame approaching flashback** *D. Mira, A. Both, A. Surapaneni* *Barcelona Supercomputing Centre*	**1B16: Reduced chemical kinetics of kerosene with pathway lumping of PAH** *E. Lameloise, A. Coudray,* *Q. Cazères, E. Riber, B. Cuenot* *CERFACS*	**1C16: Shock structure for the seven-equation, two-phase continuum mixture model** *J.B. Bdzil[1], A.K. Kapila[2], M.P. Hennessey[3]* *[1]Los Alamos National Laboratory* *[2]Rensselaer Polytechnic Institute* *[3]Lawrence Livermore National Laboratory*	**1D16: Numerical study of the effect of particle size and moisture content on biomass pyrolysis** *C. Saggese[1], S. Lapointe[1], W. Lassman[1], A. Stagni[2], T. Faravelli[2], J. Mirocha[1]* *[1]Lawrence Livermore National Laboratory* *[2]Politecnico di Milano*

	Combustion Dynamics & Instabilities I Regency AB Session Chair: A. Scholtissek	Emissions & Pollutants I Regency C Session Chair: H. Wang	Detonations, Explosions, & Supersonic Combustion II Del Mar 1 & 2 Session Chair: M. Short	Fires Encinitas 1 & 2 Session Chair: A. Stagni
17:00 - 17:20	**1A17: Review and preliminary results of MP-PIC simulations of combustion in a bubbling fluidized bed boiler** *M. Beneš, P. Eichler, J. Hrdlička, J. Klinkovský, M. Kolář, T. Smejkal, P. Skopec, J. Solovský, P. Strachota, A. Žák* *Czech Technical University in Prague*	**1B17: The role of DME addition on soot growth in premixed and non-premixed ethylene laminar flames** *F. Cepeda, L. Di Liddo, S.B. Dworkin* *Ryerson University*	**1C17: Modeling and scaling study for the decay of a blast wave transmitted by an open-ended detonation tube** *E. Tarik Balci, J. Thomas, G.N. Gaddis, E. Oran* *Texas A&M University*	**1D17: Combined effect of flame retardants and heat-loss during flame-wall interaction of partially premixed laminar flames** *M. Steinhausen[1], F. Ferraro[1], M. Schneider[1], F. Zentgraf[1], M. Greifenstein[1], D. Goedderz[1], A. Dreizler[1], C. Hasse[2], A. Scholtissek[1]* *[1]Technical University of Darmstadt* *[2]Fraunhofer Institute for Structural Durability and System Reliability LBF*
17:20 - 17:40	**1A18: Numerical studies of feedback loop mechanism for thermoacoustic instability in a swirl combustor** *S. Kumar, S. Kumar, S. Sheshadri* *IIT Bombay*	**1B18: Numerical investigation of soot formation in pressurized turbulent nonpremixed flames** *E. Quadarella, J. Guo, H.G. Im* *King Abdullah University of Science and Technology*	**1C18: A critical decay time model for predicting the critical energy of direct detonation initiation in gaseous mixtures** *Y. Liu, Q. Xie* *Tsinghua University*	**1D18: LES/Flamelet modelling of a turbulent line fire** *J. Lin, H. Zhou, G.H. Yeoh, E.R. Hawkes* *University of New South Wales*
18:00	**End of Day One** **The organizers of the 18th International Conference on Numerical Combustion would like to thank our sponsors for their generation donation:** Solar® Turbines A Caterpillar Company CONVERGE CFD SOFTWARE FM Global			

Tuesday, 10 May, 2022

07:30 - 16:00 **Registration: Hyatt Grand Foyer**

08:15 - 08:30 **Morning Announcements** in Regency DEFG: **Prof. Kalyanasundaram Seshadri, University of California – San Diego**

08:30 - 09:30 **Plenary Lecture** in Regency DEFG: **Dr. Andrea Gruber, SINTEF Energy Research and Norwegian University of Science and Technology**
Title: *The path to low-emission, on-demand, large-scale power generation and propulsion: State-of-the-art, recent progress and remaining challenges in carbon-free firing of gas turbines and the role of combustion research*
Session Chair: F.A. Williams, *University of California – San Diego*

Mini Symposium indicated by MS

09:30 - 09:40	**Transition to Morning Sessions**			
	Laminar Flames II **Regency AB** **Session Chair:** **K. Seshadri**	**Emissions & Pollutants II** **Regency C** **Session Chair:** **H. Chelliah**	**Detonations, Explosions, & Supersonic Combustion III** **Del Mar 1 & 2** **Session Chair: S. Voelkel**	**Machine Learning Applications I** **Encinitas 1 & 2** **Session Chair:** **T. Casey**
09:40 - 10:00	**2A01: Effects of hydrogen addition on the morphology of laminar n-dodecane flames at elevated pressure** *L. Esclapez[1], A. Nonaka[2], J. Bell[2], M. Day[1]* *[1]National Renewable Energy Laboratory* *[2]Lawrence Berkeley National Laboratory*	**2B01: Prediction of nitric oxide in a two-phase flow turbulent flame using large eddy simulation** *T. Naess, E. Riber, B. Cuenot* *CERFACS, Toulouse*	**2C01: Advanced surface evolution methods for detonation propagation in insensitive and non-ideal high explosives** *S. Voelkel, M. Short, C. Chiquete* *Los Alamos National Laboratory*	**2D01: Using physics-informed deep learning for high-speed reacting and non-reacting flows** *X. Lu, M. Zhong, U. Braga-Neto, E.S. Oran* *Texas A&M University*
10:00 - 10:20	**2A02: Experimental and computational investigation of the influence of ethanol on autoignition and extinction of *n*-heptane in laminar nonpremixed flows** *L. Ji[1], M. Oellerer[1,2], E. Pucher[2], K. Seshadri[1]* *[1]University of California at San Diego* *[2]Vienna University of Technology*	**2B02: A novel methodology for chemical reactor network extraction from CFD data via unsupervised clustering** *M. Savarese[1], A. Cuoci[2], W. De Paepe[1], A. Parente[1]* *[1]Université Libre de Bruxelles* *[2]Politecnico di Milano*	**2C02: Modeling the reaction zone effect on the product equation of state for high explosive detonation** *C. Chiquete, M. Short, S.J. Voelkel* *Los Alamos National Laboratory*	

	Laminar Flames II **Regency AB** **Session Chair:** **K. Seshadri**	**Emissions & Pollutants II** **Regency C** **Session Chair:** **H. Chelliah**	**Detonations, Explosions, & Supersonic Combustion III** **Del Mar 1 & 2** **Session Chair: S. Voelkel**	**Machine Learning Applications I** **Encinitas 1 & 2** **Session Chair:** **T. Casey**
10:20 - 10:40	**2A03: A DNS study of interaction of propagation flame and autoignition site at constant pressure** *R. Patil, S. Sreedhara* *Indian Institute of Technology Bombay*	**2B03: Detailed analysis of particle behaviour with focus on pollutant formation of a swirl-stabilized pulverized coal flame using FPV-LES** *D. Meller, L. Engelmann, A. Kempf* *University of Duisburg-Essen*	**2C03: Reacting condensed phase explosives in direct contact** *R. Demattè, L. Michael, N. Nikiforakis* *University of Cambridge*	
10:40 - 11:00	**BREAK – Regency Foyer**			
	DNS of Ammonia Combustion **Regency AB** **MS by M. Rieth**	**High-Performance Computing** **Regency C** **Session Chair:** **D. Mira**	**Detonations, Explosions, & Supersonic Combustion IV** **Del Mar 1 & 2** **Session Chair: A. Poludnenko**	**ML tools for the integration of reduced-order models in combustion simulations** **Encinitas 1 & 2** **MS by F. Ferraro & A. Stagni**
11:00 - 11:20	**2A04MS: Characteristics of premixed ammonia/hydrogen/nitrogen flames in intense sheared turbulence at different pressures** *M. Rieth[1], A. Gruber[2], J.H. Chen[1]* *[1]Sandia National Laboratories* *[2]SINTEF Energy Research*	**2B04: Studying the computational performance of CSP analysis on heterogeneous computing platforms** *O.H. Diaz-Ibarra[1], K. Kim[2],* *C. Safta[1], H. Najm[1]* *[1]Sandia National Laboratories, Livermore* *[2]Sandia National Laboratories, Albuquerque*	**2C04: Study of detonation structures by solving the spatially-filtered Euler equations** *A. Baumgart, G. Blanquart* *California Institute of Technology*	**2D04MS: Machine learning for chemistry manifolds: A combustion modeling approach based on artificial neural networks** *F. Ferraro[1], J. Karpowski[1], J. Bissantz[1],* *M. Steinhausen[1], A. Scholtissek[1],* *C. Hasse[1], L. Vervisch[2]* *[1]Technical University of Darmstadt* *[2]CORIA - CNRS, Normandie Université, INSA de Rouen*
11:20 - 11:40	**2A05MS: Structure and propagation characteristics of premixed ammonia flames under different turbulent conditions** *R. Khamedov, W. Song,* *F.E. Hernandez Perez, H.G. Im* *King Abdullah University of Science and Technology*	**2B05: A shared-memory-based parallel in situ adaptive tabulation for combustion simulation** *H. Zhang, S. Yang* *University of Minnesota Twin Cities*	**2C05: Acceleration effect and oscillating behavior of an overdriven concave travelling front** *J. Yao, L. Fried* *Lawrence Livermore National Laboratory*	**2D05MS: Data-enhanced analysis, parameterisation and reduced-order modelling of turbulent reacting flows** *A. Parente, L. Donato, K. Zdybal,* *A. Procacci, M. Savarese* *Université Libre de Bruxelles and Vrije Universiteit Brussel*

	DNS of Ammonia Combustion Regency AB MS by M. Rieth	High-Performance Computing Regency C Session Chair: D. Mira	Detonations, Explosions, & Supersonic Combustion IV Del Mar 1 & 2 Session Chair: A. Poludnenko	ML tools for the integration of reduced-order models in combustion simulations Encinitas 1 & 2 MS by F. Ferraro & A. Stagni
11:40 - 12:00	**2A06MS: Flexible ammonia-hydrogen blends combustion applications: A fundamental detailed study** *N. Mukundakumar, R. Bastiaans* *Eindhoven University of Technology*	**2B06: GPU acceleration of chemical time integration routines for reacting flow solvers** *S. Barwey, V. Raman* *University of Michigan*	**2C06: Computational study of variable fuel-air ratio and hydrogen doping in a rotating detonation engine** *S. Nadakkal, H. Sitaraman,* *S. Yellapantula, M.H. De Frahan,* *M. Day* *National Renewable Energy Laboratory*	**2D06MS: Generalization of super resolution method for large eddy simulation of turbulent premixed reacting flows** *T. Grenga[1], L. Nista[1],* *C.D.K. Schumann[1], A. Attili[2], H. Pitsch[1]* *[1]RWTH Aachen University* *[2]University of Edinburgh*
12:00 - 12:20	**2A07: A Study of the effects of steam addition on ammonia hydrogen air combustion** *S. Bhaduri, J.P. Gore* *Purdue University*		**2C07: Effects of non-thermal reactivity on wedge-induced oblique detonation waves** *S. Desai[1], Y. Tao[2],* *R. Sivaramakrishnan[3], J.H. Chen[1]* *[1]Sandia National Laboratories* *[2]Southeast University* *[3]Argonne National Laboratory*	**2D07MS: From detailed kinetics to large-scale simulations: Integrating data ecosystems in the skeletal reduction framework** *T. Dinelli, E. Ramalli, A. Pegurri,* *B. Pernici, T. Faravelli, A. Stagni* *Politecnico di Milano*
12:20 - 13:40	**LUNCH – La Jolla Ballroom**			
	Premixed LES II **Regency AB** **Session Chair:** **H. Pitsch**	**Droplets, Spray, & Heterogeneous Combustion III** **Regency C** **Session Chair: R. Mercier**	**Kinetics, Mechanism Reduction, & Optimization I** **Del Mar 1 & 2** **Session Chair: B. Fiorina**	**Chemistry Reduction** **Encinitas 1 & 2** **Session Chair:** **B. Franzelli**
13:40 - 14:00	**2A08: The role of progress variable dissipation rate averaging in conditional statistics for turbulent premixed combustion** *K. VanderKam, M. Mueller* *Princeton University*	**2B08: Numerical investigation of an edge flame with a water-in-fuel spray** *O.S. Eggert, J.B. Greenberg* *Technion - Israel Institute of Technology*	**2C08: Data-driven reduced chemical kinetics of energetic materials via machine learning** *K. Lee[1], A. Hernández[2], D.S. Stewart[1],* *S. Lee[3]* *[1]University of Florida* *[2]Torch Technologies* *[3]San Jose State University*	**2D08: Improving chemistry tabulation with partition of unity networks** *E. Armstrong[1], M.A. Hansen[2],* *R.C. Knaus[2], N.A. Trask[2], J.C. Hewson[2],* *J.C. Sutherland[1]* *[1]The University of Utah* *[2]Sandia National Laboratories*
14:00 - 14:20	**2A09: Using tabulated chemistry to capture non-unity Lewis number effects in turbulent premixed flames** *M. Yao, G. Blanquart* *California Institute of Technology*	**2B09: Kerosene spray combustion in vitiated air for low-emission aeronautical engines** *D. Fredrich, A. Giusti* *Imperial College London*	**2C09: A hybrid chemistry framework for the low-temperature oxidation of complex hydrocarbon fuels** *K. Gitushi[1], S. Alqahtani[2], T. Echekki[1]* *[1]North Carolina State University* *[2]King Khalid University*	**2D09: Constructing surrogates for combustion chemistry: Operator learning for reduced order dynamics** *S. Venturi, T. Casey* *Sandia National Laboratories*

	Premixed LES II Regency AB Session Chair: H. Pitsch	Droplets, Spray, & Heterogeneous Combustion III Regency C Session Chair: R. Mercier	Kinetics, Mechanism Reduction, & Optimization I Del Mar 1 & 2 Session Chair: B. Fiorina	Chemistry Reduction Encinitas 1 & 2 Session Chair: B. Franzelli
14:20 - 14:40	**2A10: A-priori analysis of CO modeling approaches for premixed turbulent jet flames with flame-wall interaction** *K. Niemietz[1], A. Attili[2], H. Pitsch[1]* *[1]RWTH Aachen University* *[2]University of Edinburgh*	**2B10: Combined numerical and experimental study of 1-octanol spray flames at ECN spray a conditions using measured vapor liquid equilibrium data** *P. Haspel[1], S. Gierth[1], M. Fechter[3], A. Peter[2], S. Rieß[2], A. Bräuer[3], M. Wensing[2], C. Hasse[1]* *[1]Technical University of Darmstadt* *[2]Friedrich-Alexander University Erlangen-Nürnberg* *[3]Technische Universität Bergakademie Freiberg*	**2C10: Efficient kinetics reduction via classification-based computational singular perturbation** *A. Carreon[1], S. Barwey[2], V. Raman[2]* *[1]University of Michigan - Ann Arbor* *[2]University of Michigan*	**2D10: Automated and efficient local adaptive regression for principal component-based reduced-order modeling of turbulent reacting flows** *G. D'Alessio, S. Sundaresan, M.E. Mueller* *Princeton University*
14:40 - 15:00	**2A11: Thermodiffusive instabilities in turbulent premixed hydrogen flames: An a priori and a posteriori analysis of flamelet-based LES combustion models** *L. Berger[1], M. Grinberg[1], A. Attili[1,2], H. Pitsch[1]* *[1]RWTH Aachen University* *[2]University of Edinburgh*	**2B11: Moment closure description of polydisperse, polykinetic and evaporating liquid sprays** *T.F. Leung, C.P. T. Groth* *University of Toronto*	**2C11: Optimization of virtual chemical mechanisms for predicting pollutant formation** *B. Fiorina[1], G. Maio[2], M. Cailler[3], H. Maldonado Colmán[1], N. Darabiha[1]* *[1]Laboratoire EM2C, CNRS* *[2]IFP Energies Nouvelles* *[3]Safran Tech*	**2D11: Artificial neural networks for tabulation of chemical kinetics: The hybrid flamelet/random data and multiple multilayer perceptron method** *T. Ding, T. Readshaw, S. Rigopoulos, W.P. Jones* *Imperial College London*
15:00 - 15:20		**2B12: DNS of spray characteristics of swirl liquid film jet in crossflow** *S. Zheng, Y. Fu, M. Chai* *Zhejiang University of Technology*	**2C12: A new single-step mechanism for partially premixed hydrocarbon combustion** *A. Millán-Merino, S. Taileb, P. Boivin* *Aix-Marseille Univ, CNRS*	**2D12: Machine-learning-aided knowledge graphs and application to combustion modelling** *E. Ramalli, T. Dinelli, A. Stagni, T. Faravelli, B. Pernici* *Politecnico di Milano*
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	Premixed LES II Regency AB Session Chair: H. Pitsch	Droplets, Spray, & Heterogeneous Combustion III Regency C Session Chair: R. Mercier	Kinetics, Mechanism Reduction, & Optimization I Del Mar 1 & 2 Session Chair: B. Fiorina	Chemistry Reduction Encinitas 1 & 2 Session Chair: B. Franzelli
15:20 - 15:40			**2C13: Optimization of a mechanism for methane-oxygen rocket engine applications** *A. Mouze-Mornettas[1,2,4], A. Bertolino[5], A. Parente[5], A. Frassoldati[6], M. Martin Benito[1], G. Dayma[2,3], F. Halter[2,3], B. Cuenot[4]* *[1]CNES* *[2]CNRS ICARE* *[3]Université d'Orléans* *[4]CERFACS* *[5]Université Libre de Bruxelles* *[6]Politecnico di Milano*	
15:40 - 16:00	**BREAK – Regency Foyer**			
	Premixed DNS I **Regency AB** **Session Chair: A. Attili**	**Material Synthesis** **Regency C** **Session Chair:**	**Numerical Methods II** **Del Mar 1 & 2** **Session Chair: P. Boivin**	**LES Data Driven Models II** **Encinitas 1 & 2** **Session Chair: A. Parente**
16:00 - 16:20	**2A14: Effect of laminar flame properties on the global response of flames subject to extreme turbulence** *P.A. Meagher[1], S. Calello III[1], J.-W. Park[1,2], X. Zhao[1]* *[1]University of Connecticut* *[2]Argonne National Laboratory*	**2B14: Modelling of aerosol synthesis of silica nanoparticles in turbulent and laminar flames** *M. Tsagkaridis, S. Rigopoulos, G. Papadakis* *Imperial College London*	**2C14: Robustness and consistency of potentially-stiff multi-way pressure couplings in compressible multi-fluid models** *A. Llor, E.H. de Montigny* *CEA, DAM/DIF*	**2D14: Physics-based dimensionality reduction and deep learning model for the progress variable dissipation rate in turbulent premixed combustion** *C. Lacey, S. Sundaresan, M. Mueller* *Princeton University*
16:20 - 16:40	**2A15: A direct numerical simulation investigation of turbulent V-shaped stratified premixed flames** *J. Ren, H. Wang, K. Luo, J. Fan* *Zhejiang University*	**2B15: Modeling TiO_2 nanoparticle formation using a bivariate method of moments with interpolative closure** *F Fröde, T. Grenga, H. Pitsch* *RWTH Aachen University*	**2C15: Recent advances in combustion modelling using Lattice-Boltzmann method** *M. Tayyab, S. Zhao, P. Boivin* *Aix Marseille Univ, CNRS*	**2D15: Physics-constrained machine learning for LES of turbulent premixed flames** *S. Suh[1], J. MacArt[2], L. Olson[1], J. Freund[1]* *[1]University of Illinois at Urbana-Champaign* *[2]University of Notre Dame*

	Premixed DNS I Regency AB Session Chair: A. Attili	Material Synthesis Regency C Session Chair:	Numerical Methods II Del Mar 1 & 2 Session Chair: P. Boivin	LES Data Driven Models II Encinitas 1 & 2 Session Chair: A. Parente
16:40 - 17:00	**2A16: Turbulent flame propagation of a multi-component gasoline surrogate fuel at high-Karlovitz number** *B.S. Soriano, T. Nguyen, J. Chen* *Sandia National Laboratories*	**2B16: Numerical simulations of TiO2 synthesis from TTIP in laboratory-scale flames** *Y. Ogata[1], A. Abdelsamie[2], J. Yi[1], C. Betrancourt[1], N. Darabiha[1], D. Thevenin[2], B. Franzelli[1]* *[1]Laboratoire EM2C, Paris-Saclay, CNRS* *[2]Otto von Guericke Universitaet Magdeburg*	**2C16: Validation of the HAMISH code: DNS of combustion with adaptive mesh refinement** *R.S. Cant[1], U. Ahmed[2], J. Fang[3], N. Chakraborty[2], G. Nivarti[1], C. Moulinec[3], D.R. Emerson[3]* *[1]Cambridge University* *[2]Newcastle University* *[3]Daresbury Laboratory*	**2D16: Enhancement of turbulence combustion models via machine learning** *R. S. M. Freitas, A. Péquin, R. Malpica Galassi, A. Parente* *Université Libre de Bruxelles*
17:00 - 17:20	**2A17: Spectral characteristics of ammonia/hydrogen/nitrogen-air turbulent premixed flames at elevated pressure** *M. Lee[1,2], M. Rieth[1], J.H. Chen[1]* *[1]Sandia National Laboratories* *[2]The University of Alabama*	**2B17: Numerical modeling of Chemical Vapor Infiltration (CVI) with detailed homogeneous and heterogeneous kinetics** *A. Cuoci[1], A. Frassoldati[1], R. Passoni[2], M. Rosa[2]* *[1]Politecnico di Milano* *[2]Brembo S.p.A.*	**2C17: Variational approaches to various numerical schemes for fluid and multi-fluid flows with geometry–energy–entropy compatibility** *A. Llor* *CEA, DAM/DIF*	**2D17: Transported PDF simulations of turbulent flames with stochastic fields and artificial neural networks** *T. Readshaw, T. Ding, S. Rigopoulos, W. Jones* *Imperial College London*
17:20 - 17:40	**2A18: 127LTFQ-0243 Flame-flame interactions and associated flame properties in ammonia enriched hydrogen-air flames at different pressures** *S. Trivedi[1], M. Rieth[2], J.H. Chen[2], R.S. Cant[1]* *[1]University of Cambridge* *[2]Sandia National Laboratories*			
18:00 – 20:00	All attendees will be given an Adult 1-Day Pass for the MTS Trolley. The blue line goes directly into Old Town San Diego. Old Town has over 30 restaurants, most with great outdoor dining, and a quaint atmosphere plus there are more than 75 unique places to shop. The Nobel Drive Station is the closest to the hotel. You will take the outbound trolley towards final stop San Ysidro to get to the Old Town Station. You will take the inbound trolley towards final stop UTC to return to the hotel. **Walking Directions to Nobel Drive Station** **Blue Line Trolley Schedule and Map** **Walking Direction from Old Town Trolley Station to Restaurant Area** (Note: Whaley House Museum is near the center of the Old Town San Diego area) **Restaurant List** **Last trolley departs Old Town for Nobel Drive Station at 23:31 (Note: 11:31 PM in San Diego Trolly Schedule)**			

Wednesday, 11 May, 2022

07:30 - 16:00 Registration: Grand Foyer

Mini Symposium indicated by MS

09:30 - 09:40	**Transition to Morning Sessions**			
	Non-premixed DNS **Regency AB** **Session Chair:** **S. Desai**	**Real Gas Effects & Supercritical Combustion** **Regency C** **Session Chair: M.H. de Frahan**	**Gas Turbines, Piston Engines, & Stationary Combustion Systems II** **Del Mar 1 & 2** **Session Chair: F. Ferraro**	**Uncertainty Quantification** **Encinitas 1 & 2** **Session Chair:** **H. Najm**
09:40 - 10:00	**3A01: A Tsuji burner in a counterflow** *B. Li, A. Sanchez, F. Williams* *University of California at San Diego*	**3B01: High-fidelity numerical simulation study of oxy-combustor: Impact of equation of state model** *M.T.H. de Frahan, B.A. Perry, O. Doroni, S. N. Appukuttan, S. Yellapantula* *National Renewable Energy Laboratory*	**3C01: Large eddy simulation of rich ammonia/hydrogen/air combustion in a gas turbine burner** *K. Bioche[1], L. Bricteux[2], J. Blondeau[1]* *[1]Vrije Universiteit Brussel and Université Libre de Bruxelles* *[2] Université de Mons (UMONS)*	**3D01: Bayesian optimal experimental design for photoionization mass spectrometry experiments** *J. Oreluk, L. Sheps, H. Najm* *Sandia National Laboratories*
10:00 - 10:20	**3A02: Direct numerical simulation of soot oxidation in a three-dimensional turbulent non-premixed ethylene jet flame** *G. Scialabba[1], L. Berger[1], A. Attili[2], H. Pitsch[1]* *[1]RWTH Aachen University* *[2]University of Edinburgh*	**3B02: The effects of real-fluid corrections on turbulent flames under transcritical conditions: A numerical study** *S. Wang, Z. Chang, H. Wang, K. Luo, J. Fan* *Zhejiang University*	**3C02: LES of an axially excited non-circular bluff-body flame** *A. Wawrzak[1], R. Kantoch[1], A. Tyliszczak[1], B. Geurts[2]* *[1]Czestochowa University of Technology* *[2]University of Twente*	**3D02: High-fidelity simulations of a Mach 8 scramjet isolator and combustor** *M. Ullman[1], C. Klarkowski[1], W. Landsberg[2], V. Raman[1], A. Veeraragavan[2]* *[1]University of Michigan* *[2]University of Queensland*
10:20 - 10:40		**3B03: High pressure turbulent cool flames - Real gas effects and pressure scaling** *N. Srinivasan, R.S. Narayan, S. Yang* *University of Minnesota*	**3C03: LES study on the influence of cycle-to-cycle variations on engine combustion and auto-ignition at knocking conditions** *M. Kircher[1], S. Gierth[1], J. Schneider[2], M. Günther[2], C. Hasse[1]* *[1]Technical University of Darmstadt* *[2]RWTH Aachen University*	
10:40 - 11:00	**BREAK – Regency Foyer** **The organizers would like to thank our sponsors for their generous donations:** Solar Turbines Convergent Science FM Global			

	Premixed DNS II **Regency AB** **Session Chair:** **T. Grenga**	**Software Engineering & Code Coupling** **Regency C** **Session Chair:** **E. Cisneros-Garibay**	**Gas Turbines, Piston Engines, & Stationary Combustion Systems III** **Del Mar 1 & 2** **Session Chair: A. Tyliszczak**	**ML Applications for Accelerated Combustion Simulations** **Encinitas 1 & 2** **MS by H. Im**
11:00 - 11:20	**3A04: Centrally-ignited outwardly propagating flames in turbulent media** *M. Matalon[1], S. Mohan[2]* *[1]University of Illinois at Urbana-Champaign* *[2]Intel Corporation*	**3B04: Pyrometheus: A code-generation package for combustion thermochemistry** *E. Cisneros-Garibay, M.T. Campbell, C. Mikida, A. Klöckner, J. B. Freund* *University of Illinois at Urbana-Champaign*	**3C04: Development of a data-driven control strategy for a diesel engine using low cetane number jet fuels** *S. R.Narayanan, A. Pal, A. Cornelius, Z. Sun, S. Yang* *University of Minnesota*	**3D04MS: An adaptive time integration scheme for stiff chemistry using computational singular perturbation and artificial neural networks** *R. Malpica Galassi[1], P.P. Ciottoli[1], M. Valorani[1], S. Barway[2], V. Raman[2], H.G. Im[3]* *[1]Sapienza University of Rome* *[2]University of Michigan* *[3]King Abdullah University of Science and Technology*
11:00 - 11:20	**3A05: A comparison of early flame kernel development in hydrogen/air and iso-octane/air mixtures under engine conditions** *H. Chu, M. Davidovic, L. Berger, H. Pitsch* *RWTH Aachen University*	**3B05: Experimental validation of multiphase particle-in-cell simulations of fluidization in a bubbling fluidized bed combustor** *M. Beneš, P. Eichler, J. Hrdlička, J. Klinkovský, M. Kolář, T. Smejkal, P. Skopec, J. Solovský, P. Strachota, A. Žák* *Czech Technical University in Prague*	**3C05: Turbulence modulation by swirling flames under practical gas-turbine conditions** *H. Xiao, K. Luo, J. Fan* *Zhejiang University*	**3D05MS: Dimensional reduction of reacting flow simulations using manifold-generated principal component analysis** *G. Giachos[1,2], M. Rafi Malik[3], A. Bellemans[2], H.G. Im[3], A. Parente[1]* *[1]Universite Libre de Bruxelles* *[2]Vrije Universiteit Brussel* *[3]King Abdullah University of Science and Technology*
11:40 - 12:00	**3A06: Influence of flow configuration and thermal wall boundary conditions on turbulence during premixed flame-wall interaction within boundary layers** *U. Ahmed[1], N. Chakraborty[1], M. Klein[2]* *[1] Newcastle University* *[2] Bundeswehr University*	**3B06: Experimental and numerical investigation of air flow through the distributor plate in a laboratory-scale model of a bubbling fluidized bed boiler** *M. Beneš[1], P. Eichler[1], R. Fučík[1], J. Hrdlička[1], J. Klinkovský[1], M. Kolář[1], T. Smejkal[1], P. Skopec[1], J. Solovský[1], P. Strachota[1], R. Straka[1,2], A. Žák[1]* *[1] Czech Technical University in Prague* *[2] AGH University of Science and Technology*	**3C06: Humidification towards flashback prevention in an original H2 fueled micro gas turbine combustor -- 0D/1D predeterminations and LES validation** *A. Pappa, L. Bricteux, W. De Paepe* *University of Mons*	**3D06MS: Data-based modeling in turbulent combustion** *R. Ranade[1], K. Gitushi[2], T. Echekki[2]* *[1]Ansys, Inc.* *[2]North Carolina State University*

	Premixed DNS II Regency AB Session Chair: T. Grenga	Software Engineering & Code Coupling Regency C Session Chair: E. Cisneros-Garibay	Gas Turbines, Piston Engines, & Stationary Combustion Systems III Del Mar 1 & 2 Session Chair: A. Tyliszczak	ML Applications for Accelerated Combustion Simulations Encinitas 1 & 2 MS by H. Im
12:00 - 12:20		**3B07: Multiphase particle-in-cell simulator for bubbling fluidized bed combustors: Development and preliminary results** *M. Beneš, P. Eichler, J. Hrdlička, J. Klinkovský, M. Kolář, T. Smejkal, P. Skopec, J. Solovský, P. Strachota, A. Žák* *Czech Technical University in Prague*		**3D07MS: ChemNODE: A neural ordinary differential equations approach for accelerating detailed chemistry calculations in reacting flow CFD** *P. Pal, T. Kumar, O. Owoyele* *Argonne National Laboratory*
12:20 - 13:40	**LUNCH – La Jolla Ballroom**			
	Kinetics, Mechanism Reduction, & Optimization II Regency AB Session Chair: U. Riedel	**Droplets, Spray, & Heterogeneous Combustion IV Regency C Session Chair: A. Cuoci**	**HPC Towards Accelerated Combustion Simulations Del Mar 1 & 2 MS by S. Desai**	**Ignition & Quenching Encinitas 1 & 2 Session Chair: P. Ronney**
13:40 - 14:00	**3A08: Skeletal kinetics reduction for type Ia supernova** *A. Nouri[2], H. Babaee[2], P. Givi[2], D. Livescu[1]* *[1]Los Alamos National Laboratory* *[2]University of Pittsburgh*	**3B08: Adaptive combustion modeling of a gas turbine engine near lean blow-out** *D. Mohaddes, M. Ihme* *Stanford University*	**3C08MS: Application and performance of dynamically bi-orthonormal decomposition based reduced-order modeling to compressible reacting flows with non-trivial boundary conditions** *S. Desai[1], H. Babaee[2], J.H. Chen[1]* *[1]Sandia National Laboratories* *[2]University of Pittsburgh*	**3D08: Hydrocarbon ignition on high surface area Pt-electroplated wires** *Y. Shi[1], P. Ronney[1], J. Whalen[2]* *[1]Pasadena Bioscience Collaborative* *[2]University of Southern California*
14:00 - 14:20	**3A09: Analysis of reaction pathways controlling chemical vapor infiltration of silicon carbide** *H. Chelliah* *University of Virginia*	**3B09: Shock-initiated fragmentation of n-dodecane nano-droplets: A molecular dynamics simulation** *N. Kateris, E. Genter, H. Wang* *Stanford University*	**3C09MS: Matrix-based formulation of chemical kinetics for accelerating direct simulation of reacting flows on GPUs** *H.A. Uranakara[1], S. Barwey[2], F.E. Hernández Pérez[1], V. Vijayarangan[1], V. Raman[2], H.G. Im[1]* *[1]King Abdullah University of Science and Technology* *[2]University of Michigan*	**3D09: Modeling differential diffusion effects in forced ignition of hydrogen-air flames with tabulated chemistry** *H. Böttler[1], X. Chen[2], S. Xie[2], A. Scholtissek[1], Z. Chen[1], C. Hasse[1]* *[1]Technical University of Darmstadt* *[2]Peking University*

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14:20 - 14:40	**3A10: Global pathway analysis on the plasma-assisted combustion of ammonia and methane** *P.N. Johnson, T. Taneja, S. Yang* *University of Minnesota Twin Cities*	**3B10: High fidelity modeling of detonation wave interaction with liquid fuel droplets** *R. Bielawski, S. Prakash, V. Raman* *University of Michigan*	**3C10MS: In situ analytics and visualization in S3D** *J. Chen[1], M. Rieth[1], T. Neuroth[2], Q. Wu[2], K.-L. Ma[2]* *[1]Sandia National Laboratories* *[2]University of California*	**3D10: Lattice-Boltzmann modelling of hazardous ignition of turbulent hydrogen jet flows** *S. Taileb, A. Millán-Merino, S. Zhao, P. Boivin* *Aix Marseille Univ, CNRS*
14:40 - 15:00	**3A11: Towards carbon-free energy carriers: Kinetics of the thermochemical reduction/oxidation of iron oxide/iron** *Q. Fradet[1], C. Kuhn[2], O. Deutschmann[2], U. Riedel[1]* *[1]German Aerospace Center* *[2]Karlsruhe Institute of Technology*	**3B11: Structure and dynamics of multi-dimensional liquid-fuel n-dodecane/air detonations with complex chemistry** *S. S. Dammati[1], Y. Kozak[2], A. Poludnenko[3]* *[1]Texas A&M University* *[2]Tel-Aviv University* *[3]University of Connecticut*	**3C11MS: Pele: An exascale-ready suite of combustion codes** *M. Day[1], L. Esclapez[1], J. Rood[1], M.H. de Frahan[1], H. Sitaraman[1], N. Wimer[1], R. Grout[1], J. Chen[2]* *[1]National Renewable Energy Laboratory* *[2]Sandia National Laboratories*	**3D11: Modeling of premixed hydrogen flame side-wall quenching using a flamelet/progress variable approach** *D. Goeb, M. Davidovic, A. Muthurajavel, H. Pitsch* *RWTH Aachen University*
15:00 - 15:20		**3B12: A Coupled-interface strategy for VOF simulations of non-spherical evaporating droplets** *E. Cipriano, A. E. Saufi, T. Faravelli, A. Cuoci* *Politecnico di Milano*		**3D12: Ignition of a turbulent nonpremixed methane–oxygen shear layer by laser-energy deposition in the oxidizer stream** *J. M. Wang[1], M. Di Renzo[2], L. Vandewalle[1], H. Wang[1], J. Urzay[1]* *[1] Stanford University* *[2] CERFACS*
15:20 - 15:40		**3B13: A numerical study on the effect of pressure on fossil and bio-derived fuel mixtures micro-explosions** *P. Guida[1], A. Ceschin[1], C. Canciani[1,2], H.G. Im[1], W.L. Roberts[1]* *[1]King Abdullah University of Science and Technology* *[2]Politecnico di Milano*		**3D13: Auto-ignition modelling in forced homogenous isotropic turbulence using LES-ADM** *L. Caban[1], A. Tyliszczak[1], B. Geurts[2], J. Domaradzki[3]* *[1] Czestochowa University of Technology* *[2] University of Twente* *[3] University of Southern California*
15:40 - 16:00	**BREAK – Regency Foyer**			

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16:00 - 16:20	**3A14: Numerical analysis of turbulent flame stabilization by nanosecond repetitively pulsed discharges** *B. Fiorina, Y. Bechane* *Université Paris-Saclay, CNRS*	**3B14: Large Eddy Simulation of the evolution of the soot distribution in turbulent reacting flows using the Bivariate Multi-Moment Sectional Method (BMMSM)** *H. Maldonado Colmán, M.E. Mueller* *Princeton University*	**3C14: Towards a novel strategy for high-fidelity simulation of coupled PDEs relying on specialized codes for combustion applications** *L. Francois[1], J. Dupays[1], M. Massot[2]* *[1] ONERA, DMPE* *[2] CMAP/CNRS*	**3D14: Data assimilation for detonation simulations** *T. Gallagher, M. Harvazinski,* *R. Munipalli* *U.S. Air Force Research Laboratory*
16:20 - 16:40	**3A15: Linearized reactive flows: An application to swirl flames** *G. Varillon[1], T. Kaiser[2], M. Merk[1],* *K. Oberleithner[2], W. Polifke[1]* *[1]Technische Universität München* *[2]Technical University Berlin*	**3B15: Characterizing the early stages of soot inception using stochastic chemical kinetics and CFD** *L. Di Liddo[1], F. Cepeda[1],* *J.C. Saldinger[2], P. Elvati[2], A. Violi[2],* *S. B. Dworkin[1]* *[1]Ryerson University* *[2]University of Michigan*	**3C15: Flammability limit prediction of hydrogen-air flames using DSMC** *S. Trivedi, J. K. Harvey, R.S. Cant* *University of Cambridge*	**3D15: Prediction of liquid jets in crossflow through the use of machine learning and large eddy simulations** *G. Tretola[1], D. Fredrich[2],* *S. Navarro-Martinez[3], K. Vogiatzaki[4]* *[1]University of Brighton* *[2]University of Cambridge* *[3]Imperial College London* *[4]King's College London*
16:40 - 17:00	**3A16: Linearizing a turbulent Bunsen flame** *T. L. Kaiser[1], G. Varillon[2],* *W. Polifke[2], T. Zirwes[3], F. Zhang[3],* *H. Bockhorn[3], K. Oberleithner[1]* *[1]Technical University Berlin* *[2]Technical University Munich* *[3]Karlsruhe Institute of Technology*	**3B16: Computationally efficient integration of a sectional soot model with FGM chemistry** *A. Kalbhor[1], D. Mira[2], J. van Oijen[1]* *[1]Eindhoven University of Technology* *[2]Barcelona Supercomputing Center*	**3C16: Super-resolution-based subfilter modeling accelerated simulations for turbulence and combustion** *M. Bode[1,2], D. Goeb* *[1]RWTH Aachen University* *[2]Forschungszentrum Jülich GmbH*	**3D16: Development of an AI based tool for rapid assessment of pyrolysis yields from plastics and biomass mixtures** *M. Parra-Alvarez[1], H. Sitaraman[1],* *V. Bharadwaj[1], C.T. Ludwig[2],* *H.W. Brandhorst[2]* *[1]National Renewable Energy Laboratory* *[2]CHZ Tecnologies, LLC*

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17:00 - 17:20	**3A17: Machine learning for flame dynamics** *A. Ghani* *Technical University Berlin*		**3C17: Numerical method using Carleman linearization for ODEs of chemical reactions toward quantum computation** *T. Akiba, Y. Morii, K. Maruta* *Tohoku University*	**3D17: A neural network based model for reactive heavy hydrocarbon potential energy surfaces** *Y. Yang, H. Najm, J. Zádor, M. Eldred* *Sandia National Laboratories*
17:20 - 17:40	**3A18: LES of a high-pressure swirled spray flame** *T. Ogier, E. Riber, B. Cuenot* *CERFACS*			**3D18: Assessment of deep learning models for nitrogen oxide formation in hydrogen flames** *A. Both, O. Baeza, D. Mira* *Barcelona Supercomputing Centre (BSC)*
18:00	**Adjourn** **The organizers would like to thank our sponsors for their generous donations:** Solar® Turbines A Caterpillar Company CONVERGE CFD SOFTWARE FM Global **We hope to see everyone at the 19th International Conference on Numerical Combustion in Kyoto, Japan in 2024**			

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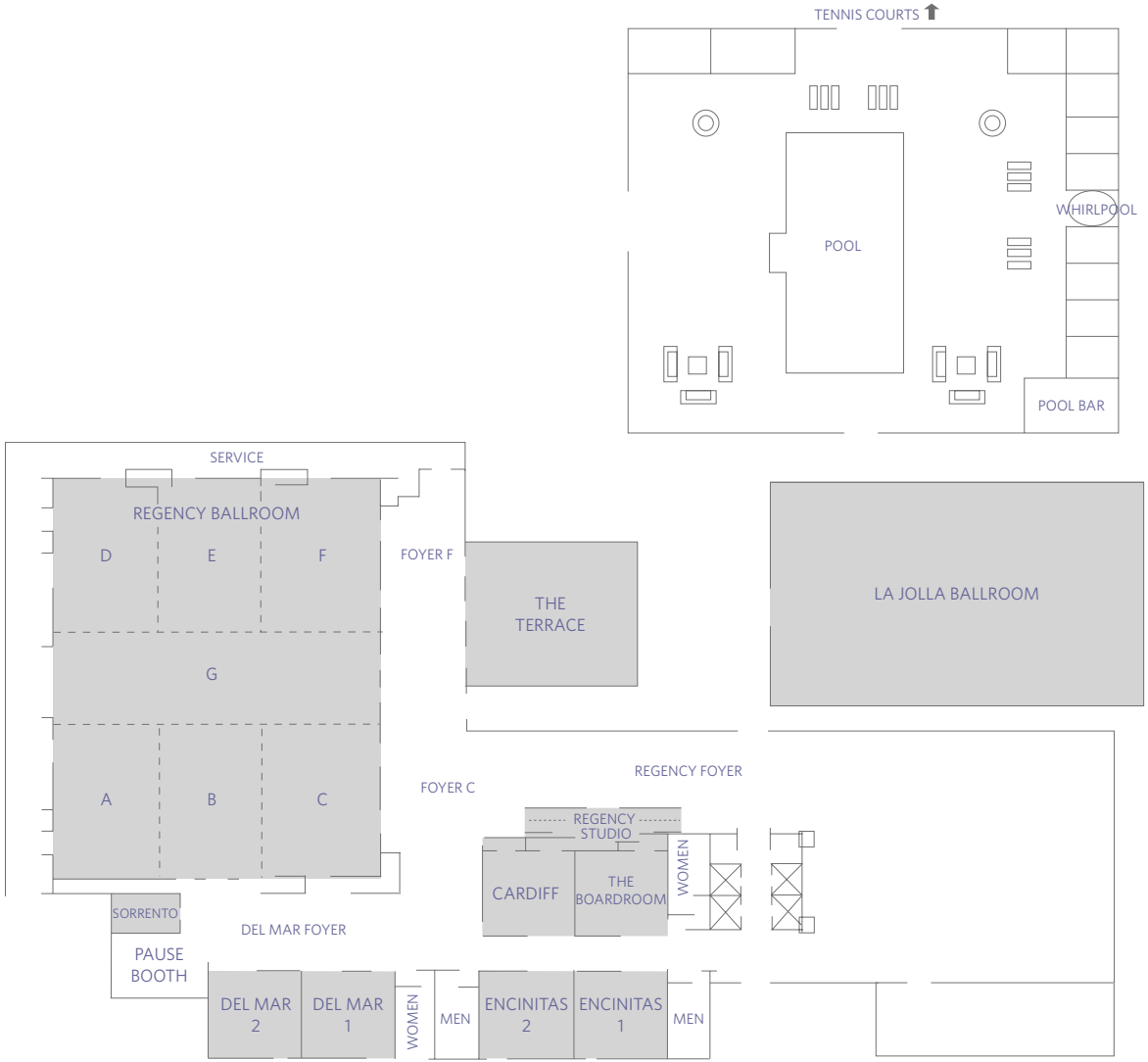

FIRST CIRCULAR

19TH INTERNATIONAL CONFERENCE ON NUMERICAL COMBUSTION (ICNC 2024)

MAY 7 - 10, 2024

KYOTO, JAPAN

The Japan Section of the Combustion Institute is pleased to announce and invite you to participate in the 19th edition of the International Conference on Numerical Combustion in Kyoto (Japan) on May 7-10, 2024. The 19th International Conference on Numerical Combustion in 2024 follows a series of conferences, the latest editions took place in Sorrento, Italy (2002), Sedona, USA (2004), Granaad, Spain (2006), Monterey, USA (2008), Corfu, Greece (2011), San Antonio, USA (2013), Avignon, France (2015), Orlando, USA (2017), Aachen, Germany (2019), San Diego, USA (2022).

The conferences will provide a forum for mutual exchange of information in the numrical combustion community involved in both fundamental and application oriented research and development works.

Kyoto City, and KYOTO TERRSA:

Kyoto City is one of the most historical places in Japan, which was the capital of Japan for more than 1,000 years from the relocation of the capital in 794 to the relocation to Tokyo in 1869, so it is called the Ancient Capital. It is also now famous as a university city. Kyoto promises to provide visitors with beatiful landscapes, amazing entertainment and fine food. Kyoto City boasts world-class accessibility, with a quick link to the Kansai International Airport. Kyoto has gained an enviable reputation among foreign visitors as a city which is easy to get around.The conference venue, KYOTO TERRSA is located within 15 min walk from JR Kyoto Station.

Co-chairs:

R. Kurose (Kyoto Univ.), M. Tanahashi (Tokyo Tech), Y. Mizobuchi (JAXA)

Secretary General:

H. Watanabe (Kyushu Univ.)

CONTACT :

For additional information please contact

Contact address: icnc2024@combustionsociety.jp

THEMES OF CONFERENCE :

The themes of the forthcoming 19th International Conference on Numerical Combustion in 2024 will include, but not be limited to basic combustion physics and technological applications on:

- **Laminar flames, kinetics, mechanism reduction**
- **Ignition, quenching**
- **Turbulent combusiton**
- **Combustion dynamics and instabilities**
- **Emissions and pollution**
- **Droplets and sprays**
- **Real gas effects in combustion**
- **Heterogeneous combustion**
- **Detonation, explosions**
- **Gas turbines, engines and furnaces**
- **Fires**
- **Micro-combustion**
- **New combustion technologies**
- **Numerical methods for reacting flows**
- **Code coupling**
- **High-performance computing for combustion applications**
- **... etc.**

CONTRIBUTIONS :

Invited lectures: Invited lectures will be given by world leading scientists.

Contributed presentations: Presentations are selected on the basis of an abstract (200 - 300 words).

Mini-symposia: (TBD)

IMPORTANT DATES :

Submission of abstract: (TBD)

Notification of acceptance: (TBD)