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Augmented Information Physical Systems Intelligence (AIPSI) for enhanced spatiotemporal early detection, attribution, prediction and decision support on multi-hazards

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We introduce and illustrate our recently developed Augmented Information Physical Systems Intelligence (AIPSI), leveraging and enhancing our proprietary Information Physical Artificial Intelligence (IPAI) and Earth System Dynamical Intelligence (ESDI) to further the mathematically robust, physically consistent and computationally efficient holistic articulation and integration across the latest advances in fundamental physics, geophysical sciences and information technologies.

In theoretical terms, AIPSI brings out a more general principled lingua franca and formal construct to complex system dynamics and analytics beyond traditional hybridisation among stochastic-dynamic, information-theoretic, artificial intelligence and mechanistic techniques.

In practical terms, it empowers improved high-resolution spatiotemporal early detection, robust attribution, high-performance forecasting and decision support across multissectorial theatres of operation pertaining multiple interacting hazards, natural, social and hybrid.

With operational applications in mind, AIPSI methodologically improves the sharp trade-off between speed and accuracy of multi-hazard phenomena sensing, analysis and simulation techniques, along with the quantification and management of the associated uncertainties and predictability with sharper spatio-temporal resolution, robustness and lead.

This is further supported by the advanced Meteoceanics QITES constellation providing coordinated volumetric dynamic sensing and processing of gravitational and electrodynamic fluctuations, thereby providing an instrumentation ecosystem for anticipatory early detection of extreme events such as flash floods, explosive cyclogenesis and imminent disruptive structural critical transitions across built and natural environments.

With the methodological developments at hand, a diverse set of applications to critical theatres of operation are presented, ranging from early detection, advance modelling and decision support to environmental and security agencies entrusted with the protection and nurturing of our society and the environment. Contributing to empowering a more robust early detection, preparedness, response, mitigation and recovery across complex socio-environmental hazards such as those

involving massive wildfires, floods and their nonlinear compound interplay, their underlying mechanisms and consequences.

The presentation concludes with an overview of a new large-scale international initiative on multi-hazard risk intelligence networks, where an eclectic diversity of actors ranging from academia and industry to institutions and the civil society come together to co-create emerging pathways for taking this challenging quest even further, in a fundamental coevolution between cutting-edge science, groundbreaking technology and socio-environmental insights to further enrich the ever-learning system dynamic framework at the core of our multi-hazard research and service.

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