



Toulouse, January, 6th, 2021

In Confidence

To Dr François Lott, President of the Section N°19 of the National Committee of CNRS

Recommendation letter for Dr Anass El Aouni

Dear Colleague,

I am very pleased to be given the opportunity to forward my opinion of Dr El Aouni, who has applied to become Chargé de Recherches CNRS on the theme “Modélisation, traitement de données pour l’océan ou l’atmosphère » in the Team SigmaPhy in the GIPSA-Lab in Grenoble.

I have known Dr El Aouni since March 2016 when I first met him during a short visit at the GEOSTAT Team at INRIA Bordeaux when he started doing his PhD with my colleague Dr Hussein Yahia. I was collaborating with Dr Yahia on Air-sea Interactions in Upwelling systems within the framework of an EU European Space Agency STSE (Support to Science Element) called Oceanflux. Anass El Aouni made a presentation of his planned PhD work between the University Mohammed-V in Rabat, Morocco and the University of Bordeaux in Applied mathematics and Scientific computing and I found him very convincing as a young scientist and already very professional. I had the opportunity to meet Anass on several occasions since when he visited the LEGOS and Mercator premises in Toulouse in June-July 2017. Anass El Aouni is one of these physicists knowing well the turbulence phenomenology and applied mathematicians willing to work together with geophysicists to foster synergy between existing competences of both communities. Dr El Aouni showed an exceptional curiosity to understand how the ocean « machinery » is functioning. This led us to work jointly on one chapter of his PhD manuscript dealing with physical and biological satellite observations of the Northwest African Upwelling to investigate its spatial extent and dynamics, this work was published in TGRS IEEE in 2019. I served as his PhD jury’s president in September 2019 and I have been impressed by the maturity and perspective he provided with his answers to the jury’s members questions. Anass was awarded in October 2020 in Paris the prestigious PhD Price on Complex Systems due to the richness and very high quality of his work.

His research project entitled: “Advancing the theory of Lagrangian Coherent Structures for Oceanic and Atmospheric Applications” fits very nicely with his scientific achievements and theoretical background. Indeed Dr El Aouni used an interdisciplinary approach combining geometrical and physical properties of material rotation and introduced new objective



definitions of Lagrangian vortices along with robust numerical procedures for their identification and tracking. The proposed approaches are naturally related to the physics underlying coherent vortices and possess unique features allowing insight characterization of their dynamics, and high vortex-monitoring from different fluid flows extending the third-dimension and including float data. Recently, during his post-doc at Jean Kuntzmann Laboratory from INRIA Grenoble, he contributed to improve multi-incremental and multigrid ocean data assimilation techniques within the framework of the European project C3S ERGO that aims at developing the next generation of seasonal forecast systems, thereby collaborating with atmospheric physicists from ECMWF, the Met Office and CERFACS. His research project will be focused on developing a generalized concept of Lagrangian coherent structures, the Coherent Barrier Transport. This generalized concept should involve, and be applicable to co-evolving quantities that are both mathematically formulated or not, giving an interdisciplinary dimension to the project in involving nonlinear fluid dynamics, phenomenological descriptions of turbulence acquired quantities, and machine learning. Dr El Aouni's work will bring essential contributions to many geophysical applications, namely in the thematics of ocean dynamics and interaction with the atmosphere, image and signal processing for oceanography, and forecasting sudden changes in environmental pollution patterns. Unraveling such coherent barriers from geophysical flows promises a simplified understanding of the overall flow geometry, an exact quantification of quantities transport, and a powerful opportunity to forecast, or even influence, large-scale flow features and mixing events.

Dr El Aouni is an extremely bright and motivated research fellow and I am fully convinced that he meets all scientific criteria for becoming an asset in the Signal Images Physiques Team in the GIPSY Lab at Grenoble. I therefore very strongly recommend his application to this post on the Concours N°19/03.

Sincerely yours,

Dr Véronique Garçon
CNRS Senior Scientist