No   : F.02.01/FTSP-Itenas/VI/2023   Bandung, September 27th, 2023
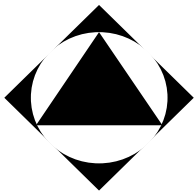Subj. : Recommendation letter

Recommendation letter for Madina Tursumbayeva's Ph.D. defense

I am writing this letter to provide my strong endorsement of Madina Tursumbayeva's request to defend her Ph.D. dissertation at Al-Farabi Kazakh National University, Almaty, Kazakhstan. I have had the privilege of serving as Madina's foreign co-supervisor during her Ph.D. program since 2020.

The Ph.D. dissertation of Madina Tursumbayeva is dedicated to the investigation of meteorological parameters that affect air quality, specifically $PM_{2.5}$ concentrations. In her research, she conducted a comprehensive analysis of $PM_{2.5}$ pollution in various Central Asian cities, including Almaty, Astana, Ashgabat, Bishkek, Dushanbe, and Tashkent. Her investigation encompassed an examination of pollution sources and the influence of meteorological factors such as temperature, humidity, wind direction, wind speed, and precipitation on $PM_{2.5}$ levels. Additionally, she utilized one-year radiosonde data to assess the impact of the planetary boundary layer height (PBLH), as well as the ventilation coefficient on $PM_{2.5}$ concentrations. The results showed a clear negative relationship between the daily average $PM_{2.5}$ concentrations and PBLH: high $PM_{2.5}$ concentrations in winter months (94.0 $\mu g\ m^{-3}$) corresponded to a lower PBLH (393 m), and low $PM_{2.5}$ concentrations in summer months (9.9 $\mu g\ m^{-3}$) corresponded to a higher PBLH (1970 m). The results of cluster analysis using the back trajectories for the highest hourly $PM_{2.5}$ concentrations during the period of 2020–2021 at 50 m AGL slow-moving air masses were typical in Almaty. While in Astana no prevailing back trajectories were found. Therefore, her research studies help to get useful insights on understanding complex relationships between air quality and meteorology can provide theoretic support for $PM_{2.5}$ predictions.

Her work resulted in the following research papers in the high-ranking journals (Q1-Q2):

1. Tursumbayeva, M., Muratuly, A., Baimatova, N., Karaca, F., Kerimray, A. (2023). Cities of Central Asia: New hotspots of air pollution in the world. Atmospheric Environment, 309, 119901. https://doi.org/10.1016/j.atmosenv.2023.119901 (**Q1, IF - 5**)

2. Mukhtarov, R., Ibragimova, O.P., Omarova, A., Tursumbayeva, M., Tursun, K., Muratuly, A., Karaca, F., Baimatova, N. (2023). An episode-based assessment for the adverse effects

of air mass trajectories on PM2.5 levels in Astana and Almaty, Kazakhstan, Urban Climate, 49, https://doi.org/10.1016/j.uclim.2023.101541 (**Q1, IF - 6.4**)

3. Tursumbayeva, M., Kerimray, A., Karaca, F., Permadi, D. A. (2022). Planetary Boundary Layer and its Relationship with PM2.5 Concentrations in Almaty, Kazakhstan. Aerosol and Air Quality Research, 22(8), 210294. https://doi.org/10.4209/aaqr.210294 (**Q2, IF - 4.0**)

Furthermore, she presented the results of her research studies at national and international conferences such as International scientific conference for students and young scientists "FARABI ALEMI" (Kazakhstan, 2021), Asian Aerosol Conference 2022 (Taiwan, 2022), Second Central Asian Air Quality Conference (Kazakhstan, 2023). While visiting the Institute of Atmospheric and Earth System Research, the University of Helsinki, Finland, Madina got acquainted with the WRF-CHIMERE modelling system. During this internship Madina Tursumbayeva demonstrated the ability to work independently with great enthusiasm and initiative. Her ability to learn new programming skills and simulation methods in a short time was very useful in conducting her research.

The Institut Teknologi Nasional Bandung (ITENAS) would be happy to continue collaborating with Madina Tursumbayeva in applying modelling systems in simulating the $PM_{2.5}$ concentrations and on the impact of urban pollution on the city surroundings such as mountains. I wish Madina all the best in her professional career. Overall, I am pleased with the accomplishments Madina Tursumbayeva has achieved throughout her PhD program and I believe that her substantial research work qualifies her to earn her PhD degree in Meteorology.

Best regards,

Didin Agustian Permadi, PhD.

Assistant professor

National Institute of Technology (ITENAS),

Bandung, Indonesia.

didin@itenas.ac.id