Class title	Dynamics of Waves in Fluid (유체파동역학)	**Credit**	3

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Level	Graduate students who are interested in atmospheric and oceanic waves and mass (constituent) transport due to those waves
Objectives	Advanced class to understand dynamics of interaction bewteen localized wave packets and large-scale flow, wave-induced Lagrangian transport, and wave-vortex duality
Pre-requisites	Mathematical methods for physicists or Engineering mathematics. Undergraduate- and graduate-level atmospheric dynamics (or dynamic meteorology or geophysical fluid dynamics). Mesoscale meteorology may also help to understand this class
References	R1: Waves and mean flow, 2nd Edition (2014), Cambridge University Press, by Oliver Bühler R2: The classical theory of fileds, 4th edition (1975), Elsevier, by L. D. Landau and E. M. Lifshitz R3: Mechanics, 3rd Edition (1976), Elsevier, by L. D. Landau and E. M. Lifshitz R4: Middle Atmosphere Dynamics (1987), Academic Press, by D. G. Andrews, J. R. Holton, and C. B. Leovy

Week	Contents
1	Dispersive waves and ray tracing
2	Ray tracing and wave activity conservation: Wave energy is not a conserved quantity
3	Zonally-averaged mean flow and internal gravity waves (GWs): Pseudomomentum
4	Zonally-averaged mean flow and internal GWs: Dissipative and nondissipative interaction
5	Interaction between zonally-averaged mean flow with shear and internal gravity waves
6	Zonally-averaged mean flow, inertia-gravity waves, and Rossby waves
7	Rossby waves and balanced dynamics: Concept of impulse
8	Mid-term exam
9	Lagrangian-mean theory: Stokes drift
10	Lagrangian-mean theory: General theory
11	Zonally symmetric generalized Lagrangian mean theory
12	A framework for local interactions: Bretherton flow
13	Wave-driven vortex dynamics on beaches: Longshore currents (Ocean waves)
14	Wave-driven vortex dynamics on beaches: Vortex dynamics (Ocean waves)
15	Wave refraction by vortices
16	Final exam