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Aerodynamics of the superstructure of a moving ship in a turbulent boundary layer GREGORY DOOLEY, AUSTIN KREBILL, J. EZEQUIEL MARTIN, JAMES BUCHHOLZ, PABLO CARRICA, University of Iowa — The airwake behind a ship is a problem of practical and fundamental interest. The complex flow resulting from the interaction of the wake from the blunt superstructure with the wave-induced motions of the ship and background turbulence of the incoming wind result in a variety of turbulent structures with scales strongly dependent on the characteristics of the ship and incoming flow. Characterization of the flow field is relevant in the context of aircraft operation in the wake region. Better understanding of the interactions between the different mechanisms driving the flow can lead to reduced order models of the case, useful for design and operational guidance for landing aircraft. REX, a ship hydrodynamics computational fluid dynamics suite able to solve both air and water phases around a moving ship has been used to explore the characteristics of the airwake. A 6-DOF solver and course-keeping controllers are used to realistically simulate the advancing ship; overset technology is used to connect the structured grids defining the computational domain. Examples of the flow around a modern surface combatant, including motions in irregular waves and turbulent fluctuations of the boundary layer as prescribed with Mann's atmospheric boundary layer model will be presented.

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