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Snowflake Impact on the Air-Sea Interface DAVID MURPHY, University of South Florida — The air-sea interface is the site of globally important exchanges of mass, momentum, and heat between the sea and atmosphere. These climate-driving exchanges occur through small-scale processes such as bubble entrainment and bursting, raindrop impact, and wind-wave creation. The physics of snowflakes falling on the sea surface has not been previously considered. High speed imaging of natural snowflakes of characteristic size up to 6.5 mm falling at a mean speed of 1 m/s into an aquarium of chilled seawater reveals a complex multiphase flow. Snowflakes impacting and crossing the air-seawater interface appear to entrain a thin air film which forms micro-bubbles as the snowflake melts. Large, morphologically complex snowflakes may entrain hundreds of micro-bubbles which are up to 0.15 mm in diameter. Large snowflakes melt milliseconds after entry and subsequently form a downward-moving vortex ring of freshwater, evident from the motion of the bubbles it contains, which may penetrate up to 16 mm below the surface. Buoyant freshwater and bubbles then rise, with larger bubbles escaping from the downward flow more quickly than the smaller bubbles. The dissolution and popping of these bubbles represent previously unrecognized sources of air-sea gas transfer and marine aerosol droplet creation, respectively.

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