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Assessment of image correlation methods for the estimation of volume flow rates of subsea oil-gas plumes CHRISTIAN WILLERT, German Aerospace Agency, STEVE WERELEY, Purdue University — The recent uncontrolled release of oil and gas from a failed well into the Gulf of Mexico in the wake of the Deep Water Horizons accident illustrated that the actual release rates are difficult to assess with established surface observation methods. To a large extent this has to do with the great depth ($\sim 1500\text{m}$) at which the oil was released and its subsequent dispersal throughout the vertical water column. Streaming video of the failure site was provided by subsea remotely operated vehicles (ROV) and allow, in principle, the quantification of the release rate on the basis of motion analysis image processing methods. Several correlation based approaches, commonly used in particle image velocimetry (PIV), are investigated with regard to estimating the propagation velocity of large scale features in the visible interface between sea water and oil plume. Together with time scale (video frame rate) and length scale (pipe diameter) the interface velocity of the plume can be estimated. Assuming the plume to be a turbulent free jet the actual volume flow rate of the oil/gas mixture can be then be recovered with reasonable accuracy.

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