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Patterns of Mixing in the Alveolar Region of the Human Lungs¹ HARIBALAN KUMAR, CHING-LONG LIN, Dept. of Mech. and Industrial Engr., The Univ. of Iowa, MERRYN H. TAWHAI, Bioengineering Inst., The Univ. of Auckland, GEOFFREY MCLENNAN, ERIC A. HOFFMAN, Dept. of Biomedical Engr., Medicine and Radiology, The Univ. of Iowa — The air-flow characteristics in the alveolar region of the human lungs is investigated to understand the mixing patterns at low Reynolds number and their relationship to transport and deposition of pharmaceutical and pollutant particles. 2D and 3D realistic honeycomblike polygonal geometries are constructed to represent alveolar sacs. An in-house characteristic-Galerkin finite element code in an ALE framework is utilized to simulate flow in the acinar airways ranging from the 17^{th} to 23^{rd} generation (with Re=1-0.01). The flow is unsteady and is driven by physiologically rhythmic wall motion. Lagrangian-based numerical visualization is used to provide a complete description of the dynamics. Results in the form of material advection (dye or blob) and stretch rate are presented. Time averaged mixing estimates are used to analyze different breathing frequencies and patterns.

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