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Analysis of Turbulent Premixed Flames using Gradient Trajectories JENS HENRIK GOEBBERT, MICHAEL GAUDING, MARKUS GAMPERT, PHILIP SCHAEFER, NORBERT PETERS, RWTH Aachen University — A new idea of analysing turbulent premixed flames was inspired by dissipation element analysis developed by Wang and Peters. Starting from every point on the flame surface in the direction of ascending and descending gradient of the underlaying curvature field, while not leaving the flame surface itself, one ends in a local maximum, respectively minimum point. The surface decomposes into fragments from which trajectories reach the same minimum and maximum. These fragments are surface-filling and do not overlap. Their geometry is non-arbitrary, since defined by the flame surface only. The linear distance between maximum and minimum of each fragment defines a length scale and the difference of curvature a scalar difference. The surface area of each fragment can then be estimated using the linear length and curvature difference. Therefore, estimating the whole flame surface area results in summing the areas of all fragments. Knowing the distribution function of the linear distance and the curvature difference can lead to a fine scale model of the flame surface area and the turbulent flame speed. DNS of the extended level-set G-equation in homogeneous isotropic forced turbulence have been performed in a cubic domain of 2π side length and 1024^3 grid points.

Jens Henrik Goebbert
RWTH Aachen University

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