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Thermoacoustic modes of intrinsic and acoustic origin and their interplay with exceptional points. ALESSANDRO ORCHINI, Technical University of Berlin, CAMILO SILVA, Technical University of Munich, GEORG MENSAH, ETH Zurich, JONAS MOECK, Norwegian University of Science and Technology — Historically, it has been presumed that thermoacoustic (TA) modes are tightly related to the acoustic modes of the cavity in which combustion takes place. Under this paradigm, a TA mode is seen as an acoustic mode that has been perturbed by the influence of an active flame. It should therefore be possible to track the evolution of acoustic modes into their corresponding TA modes by gradual increments in flame response gain, n. However, in the past few years it has been shown that this tracking is not always straightforward, due to the existence of thermoacoustic modes of 'intrinsic' origin (ITA), which persist also in anechoic conditions. Ambiguity arises in defining the origin of TA modes because two different parameters, flame strength and reflection coefficient, are usually used to define the acoustic and ITA limits. We show that this distinction is instead unique if only one parameter, n, is used to define their origin. We prove, with the help of analytical expressions, that the sets of TA modes of ITA and acoustic origins are distinct in the limit of zero n. Tracking their trajectory by increasing n is then straightforward. We numerically show that the TA eigenfrequencies follow non-monotonic trajectories, and may coalesce at Exceptional Points (EP).

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