MACH DISKS AND CAUSTIC REFLECTIONS

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The report will address issues related to the receipt of caustic reflection in, generally speaking, asymmetrical spaces. These investigations are applied to the substantiation of the occurrence of Mach disks (or rhombuses, or diamonds). The official version of the these disks origin is criticized and there is built a competing new model based on caustic reflection from environments boundary. The reasoning is illustrated by both real and the mathematical model pictures. In this report, we consider causthic reflections in the mirrors of a semi-ellipsoid and a paraboloid shape. These cases will model well-known examples from everyday life. The radiation of the waves from the respective surfaces will be carried out in a fairly small or large enough part of these surfaces near these shapes top. In this way, we will be able to emulate, for example, the behavior of plasma flow when it erupts from an engine nozzle. And then we will study strong flow compaction (i.e. caustic), arising as a result of multiple reflections inside such mirrors, which in some first approximation simulate the boundaries of separation of environments: air-plasma or air-liquid. The main conclusion of the report is that Mach disks are, in fact, the caustic reflections of the formed surface, which is the two environments boundary. If the surface dynamically changes its shape, then the corresponding caustic reflections change. In constructing the caustic reflection, we will use the law of reflection in the case when in the space there is considered, generally speaking, a non-euclidean structure, defined by an asymmetrical norm. The asymmetrical norm is determined by the functionality of the Minkovsky asymmetric convex body (ball). Choosing an asymmetrical ball can be useful, as shown in the introduction, when studying the situation with the light passage in an anisotropic environment (for example, in crystals). Note (to avoid misunderstanding) that symmetrical (normalized) spaces are the special case of asymmetrical spaces. Here asymmetrical norms are used to simulate reflections in conditions where the environment has its own speed.

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