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| | authors | <ul style="list-style-type: none">• Davide Catania• Marcello D'Abbicco• Paolo Secchi | authors | <ul style="list-style-type: none">• Catania, Davide• D'Abbicco, Marcello• Secchi, Paolo | DUPLICATES | 1061 |
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| | id | id-6515475156199695081 | id | id-7505418657297041979 | | |
| | abstract | We consider the free boundary problem for the two-dimensional plasma-vacuum interface in ideal compressible magnetohydrodynamics (MHD). In the plasma region, the flow is governed by the usual compressible MHD equations, while in the vacuum region we consider the Maxwell system for the electric and the magnetic fields. At the free interface, driven by the plasma velocity, the total pressure is continuous and the magnetic field on both sides is tangent to the boundary. We study the linear stability of rectilinear plasma-vacuum interfaces by computing the Kreiss-Lopatinskii determinant of an associated linearized boundary value problem. Apart from possible resonances, we obtain that the piecewise constant plasma-vacuum interfaces are always weakly linearly stable, independently of the size of tangential velocity, magnetic and electric fields on both sides of the characteristic discontinuity. We also prove that solutions to the linearized problem obey an energy estimate with a loss of regularity with respect to the source terms, both in the interior domain and on the boundary, due to the failure of the uniform Kreiss-Lopatinskii condition, as the Kreiss-Lopatinskii determinant associated with this linearized boundary value problem has roots on the boundary of the frequency space. In the proof of the a priori estimates, a crucial part is played by the construction of symmetrizers for a reduced differential system, which has poles at which the Kreiss-Lopatinskii condition may fail simultaneously. | abstract | We consider the free boundary problem for the two-dimensional plasma-vacuum interface in ideal compressible magnetohydrodynamics (MHD). In the plasma region, the flow is governed by the usual compressible MHD equations, while in the vacuum region we consider the Maxwell system for the electric and the magnetic fields. At the free interface, driven by the plasma velocity, the total pressure is continuous and the magnetic field on both sides is tangent to the boundary. We study the linear stability of rectilinear plasma-vacuum interfaces by computing the Kreiss-Lopatinskii determinant of an associated linearized boundary value problem. Apart from possible resonances, we obtain that the piecewise constant plasma-vacuum interfaces are always weakly linearly stable, independently of the size of tangential velocity, magnetic and electric fields on both sides of the characteristic discontinuity. We also prove that solutions to the linearized problem obey an energy estimate with a loss of regularity with respect to the source terms, both in the interior domain and on the boundary, due to the failure of the uniform Kreiss-Lopatinskii condition, as the Kreiss-Lopatinskii determinant associated with this linearized boundary value problem has roots on the boundary of the frequency space. In the proof of the a priori estimates, a crucial part is played by the construction of symmetrizers for a reduced differential system, which has poles at which the Kreiss-Lopatinskii condition may fail simultaneously.Comment: 38 page | | |
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