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## **Stability analysis on a four-fluid cosmic-ray-MHD system**

### **Abstract content**

We study the linear stability of a cosmic-ray-MHD system in the hydrodynamic approach. The system comprises four fluids: magnetized thermal plasma, cosmic rays, forward and backward propagating Alfvén waves. The coupling between plasma, cosmic rays, and waves depends on the waves themselves. We perform short-wavelength linear stability analysis and find that the Alfvén mode is not affected while the magneto-acoustic modes are modified. The unstable/stable regions in the background parameter space are rather complex. In general if the thermal pressure is large enough the system is stable. However, it is interesting to note that if the background has only one Alfvén wave, the system is more unstable.

**If this paper is presented for a collaboration, please specify the collaboration**

### **Summary**

### **Reference**

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