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# Scintillations and interstellar Levy flights

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Observations of radio signals from distant pulsars provide a valuable tool for investigation of interstellar turbulence. The time-shapes of the signals are the result of pulse broadening by the fluctuating electron density in the interstellar medium. While the scaling of the shapes with the signal frequency is well understood, the observed anomalous scaling with respect to the pulsar distance has remained a puzzle for more than 30 years.

We propose a new model for interstellar electron density fluctuations, which explains the observed scaling relations. We suggest that these fluctuations obey Lévy statistics rather than Gaussian statistics, as assumed in previous treatments of interstellar scintillations. We argue that such statistics can naturally arise as a result of random density fragmentation and advection by sonic or super-sonic turbulence in the interstellar medium. A ray propagating through such a non-homogeneous medium performs a Lévy flight rather than the standard Gaussian random walk.

## References

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