The Cooling of Massive White Dwarfs from Gaia EDR3

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The *Gaia* mission has revealed the largest number of white dwarfs ever observed in our galaxy and revolutionized the study of white dwarfs. *Gaia*'s second data release (DR2) revealed the presence of the Q branch, a transversal population of massive white dwarfs in the colour magnitude diagram with mass above $\sim 1\ M_{\odot}$ that is not aligned with theoretical cooling tracks. While a pile-up of white dwarfs along the Q branch is expected in standard cooling models as a consequence of core crystallization, *Gaia* DR2 also revealed evidence of an additional anomalous cooling delay along the Q branch that was not explained by standard cooling models. In this talk we will present the results of re-investigating this apparent cooling delay using the improved statistical power of the most recent *Gaia* data, the early third data release (EDR3). We will present the cooling age distributions of $0.95 - 1.25\ M_{\odot}$ *Gaia* EDR3 white dwarfs within 200 pc of the Sun according to different publicly available white dwarf cooling models and discuss the mass dependence of the cooling age distributions. We will show that under the assumption of a constant white dwarf formation rate there is a pile-up of white dwarfs both along the Q branch and beyond it that would indicate an anomalous cooling delay, then demonstrate how accounting for the time-varying star formation rate of main sequence progenitors can explain this anomaly. For the lighter $0.95 - 1.15\ M_{\odot}$ white dwarfs, we will show that the cooling age distributions are statistically consistent with the expectation from the time-varying star formation rate observed for *Gaia* DR2 main sequence stars. For the heaviest white dwarfs, with mass $1.15 - 1.25\ M_{\odot}$, we will show that the cooling age distribution is statistically consistent with a uniform distribution rather than the star formation rate and demonstrate how this can be explained if a significant fraction of the most massive white dwarfs are the result of mergers.