The challenge of explaining the nonlinear features in the light curve of the ZZ Ceti star G117-B15A

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During the EUROWD08 meeting in Barcelona, one of us (G.F.) proposed a friendly challenge to Dr. Mike Montgomery (U. Texas at Austin), that of explaining quantitatively the nonlinear structure seen in the light curve of the ZZ Ceti pulsator G117-B15A. The debate had been about the importance of including the nonlinear response of the instantaneous emergent flux to the temperature perturbation (to an excellent level of approximation, g-mode pulsations in white dwarfs can be seen basically as temperature waves), a physical effect that we have claimed can never be ignored in calculations of that sort. We have described this effect in details in Brassard, Fontaine, & Wesemael (1995, ApJS, 96, 545), but it would seem that this publication has been systematically ignored by Dr. Montgomery and others. In Barcelona, we therefore made the point that Dr. Montgomery's efforts to model the nonlinear pulse shapes of pulsating white dwarfs are tinted by what we consider to be a major deficiency.

To prove our point, we considered this phenomeneon of the nonlinear response of the flux to a temperature perturbation as the *only* source of nonlinearity in our models. The challenge was to account for the existence and the amplitudes of 8 nonlinear peaks (harmonics and cross-frequencies of 3 independent modes) seen in the light curve of G117-B15A. We present our results in this poster. We do not know how our distinguished colleague did fare in this challenge, but the bottle of champagne is likely to end in our camp.