

F -isocrystals with log-decay and genus growth in towers of curves

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We introduce a category of F -isocrystals on curves with log-decay. Such F -isocrystals arise naturally as the isoclinic components of overconvergent F -isocrystals. We then prove an infinite local monodromy theorem analogous to Tsuzuki's finite local monodromy theorem for overconvergent F -isocrystals. This theorem relates the log-decay property for unit-root F -isocrystals to the asymptotic growth of higher ramification groups for the corresponding Galois representation. For a rank one F -isocrystal M this connection can be made precise: the Newton polygon of a transcendental solution of M completely determines the ramification polygon of the Galois representation. As an application we prove that the genera growth in a \mathbb{Z}_p -tower arising from the monodromy of a family of smooth varieties is given by a polynomial whose degree is determined by the generic Newton polygon of this family. This confirms a conjecture of Daqing Wan.