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We consider the set of permutations all of whose descents are from an even value to an even value. Proving a conjecture of Kitaev and Remmel, we show that these permutations are enumerated by Genocchi numbers. Hence, they have the same cardinality as Dumont permutations (of the first or second kind) and thus may be called *Dumont permutations of the third kind*. We also define the related *Dumont permutations of the fourth kind*. We find certain statistics on Dumont permutations of the third and fourth kinds that generate the Seidel triangle for Genocchi numbers. Finally, we consider the distribution of certain pattern statistics on Dumont permutations of the first and third kinds. (Received August 07, 2007)