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Linking Numbers, Mild Groups and the Fontaine-Mazur Conjecture

Let p be a prime, let S be a finite set of primes $q \equiv 1 \bmod p$ but $q \not\equiv 1 \bmod p^2$ and let G_S be the Galois group of the maximal p-extension of $\mathbb{Q}$ unramified outside of S. If ρ is a continuous homomorphism of G_S into $\mathrm{GL}_2(\mathbb{Z}_p)$ we use the Koch presentation of G_S and the theory of mild pro-p-groups to show that if $p > 3$ then, under certain conditions on the linking numbers of the primes in S, either $\rho = 1$ or $\rho(G_S)$ is a Sylow p-subgroup of $\mathrm{SL}_2(\mathbb{Z}_p)$. Under certain conditions on S with $|S| = 2, 3$, we show that $\rho = 1$.