Constructing the regular representations of GL_N over local rings

Let F be a non-Archimedean local field with ring of integers $\mathcal{O}$ and maximal ideal $\mathfrak{p}$. T. Shintani and G. Hill independently introduced a large class of smooth representations of $\mathrm{GL}_N(\mathcal{O})$, called regular representations. Roughly speaking they correspond to elements in the Lie algebra $\mathrm{M}_N(\mathcal{O})$ which are regular mod $\mathfrak{p}$ (i.e, having centraliser of dimension N). Shintani and Hill constructed all the regular representations with even conductor, but the case of odd conductor is much harder and was only carried out in some special cases. We will outline a construction of all the regular representations with odd conductor. The method is analogous to the construction of supercuspidal representations of $\mathrm{GL}_N(F)$ due to Bushnell and Kutzko. This is joint work with Shaun Stevens.