Displays for $\Gamma_0(p)$-level structure and applications

Goal: Write the universal display for PEL type Shimura varieties in characteristic 0–p with $\Gamma_0(p)$-level structure at p (i.e., a totally isotropic subgroup scheme killed by p).

The starting point could be the universal display for Siegel modular varieties, written by F. Oort, or for Hilbert modular varieties, written by F. Andreatta and E. Goren. The first task is to write down the universal isogeny between displays in the presence of $\Gamma_0(p)$-level structure.

Potential applications:

(1) Study of the canonical subgroup and the map $d\log$ which are more and more useful in order to define p-adic modular forms;

(2) Study the local structure of moduli spaces with $\Gamma_0(p)$-level and the geometry of the U_p-correspondence. For example, in the Hilbert case P. Kassaei and E. Goren used several tricks (reduction to special points etc.) in order to achieve this description due to the absence of a good theory of displays.

(3) Study its relation with Kisin's theory and its extension due to A. Vasiu and T. Zink in the relative setting. This could provide useful tools for the definition and the study of integral models of Shimura varieties of PEL type with $\Gamma_0(p)$-level structures.

Prerequisites (*to be covered within the first year*) p-divisible groups and Dieudonné theory (paper by Tate, book by Demazure), T. Zink's theory of displays.