

$\Rightarrow$  We have a sheaf  $\mathcal{H}^q$  whose stalk is

$$\mathcal{H}_x^q = \lim_{U \ni x} \frac{\ker \{d: \mathcal{K}^q(U) \rightarrow \mathcal{K}^{q+1}(U)\}}{d \mathcal{K}^{q-1}(U)}$$

A section  $\sigma$  of  $\mathcal{H}^q$  over an open set  $U \subset X$  is given by a covering  $\{U_\alpha\}$  of  $U$  and  $\sigma_\alpha \in \mathcal{K}^q(U_\alpha)$  s.t.

$$d\sigma_\alpha = 0,$$

$$\sigma_\alpha - \sigma_\beta = d\eta_{\alpha\beta}, \quad \eta_{\alpha\beta} \in \mathcal{K}^{q-1}(U_\alpha \cap U_\beta);$$

the section is zero in case

$$\sigma_\alpha = d\eta_\alpha, \quad \eta_\alpha \in \mathcal{K}^{q-1}(U_\alpha),$$

after perhaps refining the given covering.

$$\mathcal{H}^q = \bigcup_{x \in X} \mathcal{H}_x^q = \bigcup_{x \in X} \lim_{U \ni x} \frac{\ker \{d: \mathcal{K}^q(U) \rightarrow \mathcal{K}^{q+1}(U)\}}{d \mathcal{K}^{q-1}(U)}$$

$\mathcal{H}^q(U) \ni \sigma \Rightarrow \sigma(x) \in \mathcal{H}_x^q$  satisfying the following:

For each  $p \in U$ ,  $\exists$  an open set  $V_p \subset U$  s.t.

$$p \in V_p \text{ \& \& } \exists s_p \in \frac{\ker \{d: \mathcal{K}^q(V_p) \rightarrow \mathcal{K}^{q+1}(V_p)\}}{d \mathcal{K}^{q-1}(V_p)} \text{ s.t. } \left. \begin{array}{l} \text{the germ of } s_p \text{ at } y \\ = \sigma(y) \end{array} \right\} \textcircled{*}$$

the germ of  $s_p$  at  $y$  =  $\sigma(y)$ .

$\Rightarrow$  For each point  $p \in U$ ,  $\exists V_p$  and  $s_p = \sigma_p +$   
 $\frac{0}{d \mathcal{K}^{q-1}(V_p)} \text{ s.t. } d\sigma_p = 0$   
 $\text{On } V_p \cap V_{p'}, \quad s_p|_{V_p \cap V_{p'}} = s_{p'}|_{V_p \cap V_{p'}} \xrightarrow{\text{by } \textcircled{*}} \Rightarrow$

$$\sigma_p|_{V_p \cap V_{p'}} + d \mathcal{K}^{q-1}(V_p \cap V_{p'}) = \sigma_{p'} + d \mathcal{K}^{q-1}(V_p \cap V_{p'})$$

$$\Rightarrow \sigma_p - \sigma_{p'} = d \eta_{pp'}, \quad \eta_{pp'} \in \mathcal{K}^{q-1}(V_p \cap V_{p'}).$$

In case,  $\sigma(x) = 0 \Rightarrow \exists$  open set  $U \ni x$  s.t.  $\sigma_u = 0$  on  $U$