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Erratum to: Variations by generalized symmetries of local Noether strong currents equivalent to global canonical Noether currents

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Abstract. We correct misprints in a formula in the last sentence at the end of page 129; the first paragraph of subsection 4.1; misprints at the end of page 132 and in Proposition 1 at page 133 of the paper 'Variations by generalized symmetries of local Noether strong currents equivalent to global canonical Noether currents', Communications in Mathematics 24 (2016), 125–135. DOI: 10.1515/cm-2016-0009

1 Errata corrige

- The formulae in the last sentence at the end of page 129 should read as follows.

$$\mathcal{E}_{n+1}(\eta) = 0 \qquad \mathfrak{d}\eta = 0$$
$$\delta_n(\eta) \neq 0 \implies \mathfrak{d}\lambda_i \neq 0\,,$$

- The first paragraph of subsection 4.1 should read as follows.

  Suppose that $\mathfrak{d}\mathcal{L}_{j^r\Xi}\lambda_i = 0$. We are here particularly concerned with the case when $\mathcal{L}_{j^r\Xi}\lambda_i \neq 0$ *i.e.* $j^r\Xi$ is a generalized symmetry, that means $\mathcal{L}_{j^r\Xi}\lambda_i =_{\mathrm{loc.}} d_H\beta_i$. In fact, since $\mathcal{E}_n(\mathcal{L}_{j^r\Xi}\lambda_i) = 0$ then $\mathcal{L}_{j^r\Xi}\lambda_i$ defines a cohomology class and we have $\delta_{n-1}(\mathcal{L}_{j^r\Xi}\lambda_i) \neq 0$ which implies $\mathfrak{d}\beta_i \neq 0$. Notice that if $\mathfrak{d}\mathcal{L}_{j^r\Xi}\lambda_i = 0$ then $0 = \mathfrak{d}d_H\beta_i = d_H\mathfrak{d}\beta_i$.

- the last line at page 132 should read:

  [...] always satisfied for vertical generalized symmetries of global dynamical forms.

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- Proposition 1 at page 133 should read as follows.

Proposition 1. *Let $j^r\Xi$ be a vertical generalized symmetry. The coboundary of the strong Noether currents is locally exact,* i.e. $d_H(\mathfrak{d}(\nu_i + \epsilon_i)) = 0$.

Proof. To get the assertion it is enough to prove that $\mathfrak{d}\mathcal{L}_{j^r\Xi}\lambda_i = 0$. To prove this we note that we have, identically,

$$\delta_n\mathcal{E}_n(\mathfrak{d}\mathcal{L}_{j^r\Xi}\lambda_i) = 0\,.$$

Indeed, by linearity

$$\delta_n\mathcal{E}_n(\mathfrak{d}\mathcal{L}_{j^r\Xi}\lambda_i) = \delta_n\mathfrak{d}\mathcal{E}_n(\mathcal{L}_{j^r\Xi}\lambda_i) = \delta_n\mathfrak{d}\mathcal{L}_{j^r\Xi}\mathcal{E}_n(\lambda_i)\,,$$

and being $j^r\Xi$ a generalized symmetry $\mathcal{L}_{j^r\Xi}\mathcal{E}_n(\lambda_i) = 0$, thus we get immediately the result, because this implies $\mathfrak{d}(\mathfrak{d}\mathcal{L}_{j^r\Xi}(\lambda_i) - i(d_H\bar{\beta}_i)) = 0$, *i.e.* $d_H\bar{\beta}_i = \mathfrak{d}d_H\bar{\psi}_i$; for vertical generalized symmetries we have $\mathfrak{d}\bar{\psi}_i = d_H\hat{\psi}_{ij}$ which gives us the results.

Note that the result holds true for any generalized symmetry (not necessarily vertical) of η_{λ_i} generating Noether *conserved* currents for Lagrangians of the type $\lambda_i - d_H\mu_i$, with μ_i satisfying $d_H\beta_i = d_H\mathcal{L}_{j^r\Xi}\mu_i$ and $\mathcal{L}_{j^r\Xi}\mu_i = d_H\psi_i + \mathfrak{d}\bar{\psi}_i$. A necessary condition for any generalized symmetry to generate Noether strong currents with closed coboundary is $\mathcal{L}_{j^r\Xi}\mathcal{L}_{j^r\Xi}\mathfrak{d}\lambda_i = 0$. ☐

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