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

Marcella Palese

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.

\[ E_{n+1}(\eta) = 0 \quad \delta \eta = 0 \]
\[ \delta_n(\eta) \neq 0 \implies \delta \lambda_i \neq 0, \]

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

Suppose that \( \delta L_{j^r \Xi} \lambda_i = 0 \). We are here particularly concerned with the case when \( L_{j^r \Xi} \lambda_i \neq 0 \) i.e. \( j^r \Xi \) is a generalized symmetry, that means \( L_{j^r \Xi} \lambda_i = \text{loc.} \). \( d_H \beta_i \). In fact, since \( E_n(L_{j^r \Xi} \lambda_i) = 0 \) then \( L_{j^r \Xi} \lambda_i \) defines a cohomology class and we have \( \delta_{n-1}(L_{j^r \Xi} \lambda_i) \neq 0 \) which implies \( \delta \beta_i \neq 0 \). Notice that if \( \delta L_{j^r \Xi} \lambda_i = 0 \) then \( 0 = \delta d_H \beta_i = d_H \delta \beta_i \).

- the last line at page 132 should read:

\[ \ldots \text{always satisfied for vertical generalized symmetries of global dynamical forms.} \]

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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. $d_H(\partial(\nu_i + \epsilon_i)) = 0$.

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

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

Indeed, by linearity

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

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 $\partial(\partial\mathcal{L}_{j^r\Xi}(\lambda_i) - i(d_H\beta_i)) = 0$, i.e. $d_H\beta_i = d\mathcal{H}^i\tilde{\psi}_i$; for vertical generalized symmetries we have $\partial\psi_i = d_H\psi_i$, which gives us the results.

Note that the result holds true for any generalized symmetry (not necessarily vertical) of $\eta_{\lambda_i}$ generating Noether conserved currents for Lagrangians of the type $\lambda_i - d_H\mu_i$, with $\mu_i$ satisfying $d_H\beta_i = d_H\mathcal{L}_{j^r\Xi}\mu_i$ and $\mathcal{L}_{j^r\Xi}\mu_i = d_H\psi_i + \partial\tilde{\psi}_i$.

A necessary condition for any generalized symmetry to generate Noether strong currents with closed coboundary is $\mathcal{L}_{j^r\Xi}\partial\mathcal{L}_{j^r\Xi}\partial\lambda_i = 0$. □

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