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Erratum to: Ricci Solitons in 3-Dimensional Normal Almost Paracontact Metric Manifolds [Int. Electron. J. Geom., Vol.8, No:2, 2015, 34-45.]

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ABSTRACT

The authors would like to correct some errors which appear in the orginal publication of the article "Ricci Solitons in 3-Dimensional Normal Almost Paracontact Metric Manifolds [Int. Electron. J. Geom., Vol.8, No:2, 2015, 34-45.]".

Keywords: *Normal almost paracontact metric manifold; Ricci soliton; gradient Ricci soliton; η-Einstein manifold.*
AMS Subject Classification (2010): *Primary: 53C15; Secondary: 53C50.*

The authors would like to correct some errors which appear in the orginal publication of the article [1]. The corrections are given in the followings:

In page 37, equation (3.6) and equation (3.7) must be

$$S(X,Y) = -\left(\frac{r}{2} + \alpha^2 + \beta^2\right) g(\varphi X, \varphi Y) - 2(\alpha^2+\beta^2)\eta(X)\eta(Y),$$

and

$$QX = \left(\frac{r}{2} + \alpha^2 + \beta^2\right) X + \left(-\frac{r}{2} - 3(\alpha^2+\beta^2)\right)\eta(X)\xi,$$

respectively. So, the expression of Riemann curvature tensor R which is given by equation (3.8) shall be replaced by

$$\begin{aligned} R(X,Y)Z &= \left(\frac{r}{2} + 2\left(\alpha^2+\beta^2\right)\right)(g(Y,Z)X - g(X,Z)Y) \\ &-g(X,Z)\left(-\frac{r}{2} - 3(\alpha^2+\beta^2)\right)\eta(Y)\xi \\ &+\left(-\frac{r}{2} - 3(\alpha^2+\beta^2)\right)\eta(Y)\eta(Z)X \\ &+g(Y,Z)\left(-\frac{r}{2} - 3(\alpha^2+\beta^2)\right)\eta(X)\xi \\ &-\left(-\frac{r}{2} - 3(\alpha^2+\beta^2)\right)\eta(X)\eta(Z)Y. \end{aligned}$$

In page 39, equation (4.4) and equation (4.5) must be

$$Xb + (\xi b)\eta(X) - 4(\alpha^2+\beta^2)\eta(X) + 2\lambda\eta(X) = 0$$

and

$$\xi b = 2(\alpha^2+\beta^2) - \lambda,$$

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which imply $Xb = (2(\alpha^2+\beta^2)-\lambda)\eta(X)$. From the last two equations given above, equation (4.6) must be

$$db = (2(\alpha^2+\beta^2)-\lambda)\eta.$$

In page 40, line 3, the equation given by $(2(\alpha^2+\beta^2)+\lambda)d\eta = 0$ must be $(2(\alpha^2+\beta^2)-\lambda)d\eta = 0$. Then Equation (4.7) must be

$$2(\alpha^2+\beta^2) = \lambda.$$

In page 40, line 30, $2(\alpha^2+\beta^2) = \mu+\rho$ must be $-2(\alpha^2+\beta^2) = \mu+\rho$. Then in the same page, line 31, μ must be equal to $-2(\alpha^2+\beta^2)-\alpha$ =constant.

Thus, Theorem 4.2. must be stated as in the following

Theorem 0.1. *Let M be a 3-dimensional non-paracosymplectic normal almost paracontact metric manifold with α, β =constant. If M is an η-Einstein manifold with $S = \mu g + \rho\eta\otimes\eta$, then the manifold admits a Ricci soliton $(g, \xi, (\mu+\rho))$.*

In page 41, equation (4.14) must be

$$\begin{aligned} (\pounds_\xi\, g)(X,Y) + 2S(X,Y) &= \left\{r + 2\left(\alpha^2+\beta^2+\alpha\right)\right\} g(X,Y) \\ &\quad - \left\{r - 2\left(-3\left(\alpha^2+\beta^2\right)-\alpha\right)\right\}\eta(X)\eta(Y). \end{aligned}$$

Equation (4.15) must be

$$\left\{r + 2\left(\alpha^2+\beta^2+\alpha+\lambda\right)\right\} g(X,Y) - \left\{r - 2\left(-3(\alpha^2+\beta^2)-\alpha\right)\right\}\eta(X)\eta(Y) = 0.$$

and so equation which express λ must be given by

$$\lambda = \alpha^2+\beta^2.$$

Thus, Theorem 4.3. shall be replaced by the following theorem:

Theorem 0.2. *If a 3-dimensional non-paracosymplectic normal almost paracontact metric manifold with α, β =constant admits a Ricci soliton (g, ξ, λ) then the Ricci soliton is expanding.*

In page 41, equation (4.16) must be

$$B(X,Y) = \left\{r + 2\left(\alpha^2+\beta^2\right)\right\} g(X,Y) - \left\{r - 2\left(-3\left(\alpha^2+\beta^2\right)-\alpha\right)\right\}\eta(X)\eta(Y).$$

Taking into account the last equation above and parallel symmetric $(0,2)$-tensor field B, the term $\left\{r - 2\left(\alpha^2+\beta^2-\alpha\right)\right\}$ in the expression of $(\nabla_U\, B)(X,Y)$ shall be replaced by $\left\{r - 2\left(-3\left(\alpha^2+\beta^2\right)-\alpha\right)\right\}$.

In page 42, equation (5.4), (5.5) and (5.6) must be

$$\begin{aligned} (\nabla_U\, Q)\, X &= \frac{dr(U)}{2}\,(X - \eta(X)\xi) \\ &\quad + \left(-\frac{r}{2} - 3\left(\alpha^2+\beta^2\right)\right)\{\alpha\left[(g(X,U) - 2\eta(X)\eta(U))\xi + \eta(X)U\right] \\ &\qquad + \beta\left[g(X,\varphi U)\xi + \eta(X)\varphi U\right]\}, \end{aligned}$$

$$(\nabla_\xi\, Q)\, X = \frac{dr(\xi)}{2}\,(X - \eta(X)\xi),$$

and

$$(\nabla_U\, Q)\,\xi = -\left(-\frac{r}{2} - 3\left(\alpha^2+\beta^2\right)\right)(\alpha\,(\eta(U) - U)\,\xi - \beta\varphi U).$$

The authors would like to apologize to the readers for any inconvenience of these errors might have caused.

References

[1] Yüksel Perktaş S. and Keleş, S., Ricci-Solitons in 3-dimensional Normal almost Para-contact metric manifolds. *Int. Electron. J. Geom.*, **8** (2015), no.2, 34-45.

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