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ON THE COSYMPLECTIC BOCHNER CURVATURE TENSOR

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§ 0. Introduction.

In a previous paper [3] K. Yano, U-H. Ki and the present author studied on transversal hypersurfaces of an almost contact manifold, that is, hypersurfaces which never contain the vector field ξ defining the almost contact structure.

In the present paper, we shall find a relation between the contact Bochner curvature tensor of a Sasakian manifold and the Bochner curvature tensor of the transversal Kaehlerian hypersurface.

The purpose of the present paper is to define the cosymplectic Bochner curvature tensor in relation to the contact Bochner curvature tensor and to seek out the form of the components of the cosymplectic Bochner curvature tensor.

§ 1. Transversal hypersurface of an almost contact manifold.

Let M be $(2n+1)$-dimensional differentiable manifold covered by a system of coordinate neighborhoods $\{U;\ y^h\}$, where, here and in the sequel, the indices $h, i, j, k, \cdots$ run over the range $\{1, 2, \cdots, 2n+1\}$ and let M admit an almost contact metric structure, that is, a set $(\varphi_j{}^h,\ \xi^h,\ \eta_j,\ g_{ji})$ of a tensor field $\varphi_j{}^h$ of type $(1,1)$, a vector field ξ^h, a 1-form η_j and a positive definite Riemannian metric g_{ji} satisfying

$$(1.1)\qquad \varphi_j{}^h\varphi_i{}^j=-\delta_i^h+\eta_i\xi^h,\qquad \eta_i\varphi_h{}^i=0,\qquad \varphi_i{}^h\xi^i=0,\qquad \eta_t\xi^t=1,$$

$$(1.2)\qquad g_{ji}\varphi_h{}^j\varphi_k{}^i=g_{hk}-\eta_h\eta_k,\qquad \eta_j=g_{ji}\xi^i,\qquad g_{ji}\xi^j\xi^i=1.$$

Consider a $2n$-dimensional differentiable manifold $\overline{M}$ covered by a system of coordinate neighborhoods $\{V;\ x^a\}$, where, here and in the sequel, the indices $a, b, c, d, \cdots$ run over the range $\{1, 2, \cdots, 2n\}$, and assume that $\overline{M}$ is differentiably immersed in M as a hypersurface by the immersion $i:\ \overline{M}\to M$, which expressed locally by $y^h=y^h(x^a)$.

We assume that for each $p\in\overline{M}$, the vector field ξ^h at $i(p)$ never belongs to the tangent hyperplane of the hypersurface $i(\overline{M})$. We call such a hyper-

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surface $i(\overline{M})$ a *transversal hypersurface* of an almost contact manifold. In this case, we can take ξ^h as an affine normal to the hypersurface $i(\overline{M})$.

Now the vector $B_a{}^h=\partial_a y^h$ $(\partial_a=\partial/\partial x^a)$ and ξ^h being linearly independent, the transforms $\varphi_h{}^i B_a{}^h$ of $B_a{}^h$ by $\varphi_h{}^i$ can be experssed as

$$\varphi_h{}^i B_a{}^h=B_b{}^i F_a{}^b+\alpha_a \xi^i, \tag{1.3}$$

where $F_a{}^b$ is a tensor field of type (1, 1) and α_a a 1-form of $\overline{M}$.

Applying $\varphi_k{}^i$ again to (1.3) and taking account of (1.1), we find

$$F_b{}^c F_a{}^b=-\delta_a{}^c, \qquad \alpha_c F_a{}^c=\eta_a, \tag{1.4}$$

where

$$\eta_a=B_a{}^h \eta_h. \tag{1.5}$$

Thus $\overline{M}$ admits an almost complex structure F and 1-form α.

Transvecting the first equation of (1.2) with $B_b{}^h B_c{}^k$ and using (1.3), we obtain [3]

$$F_c{}^a F_b{}^e (g_{ae}-\eta_a \eta_e)=g_{cb}-\eta_c \eta_b, \tag{1.6}$$

where $g_{cb}=B_c{}^k B_b{}^j g_{kj}$.

This shows that

$$\gamma_{cb}=g_{cb}-\eta_c \eta_b \tag{1.7}$$

is an almost Hermitian metric with respect to the almost complex structure F.

In the previous paper [3], we proved that γ_{cb} is positive definite.

We now assume that $\overline{M}$ is orientable and choose a unit vector field C^h of M normal to $i(\overline{M})$ in such a way that $2n+1$ vectors $B_a{}^h$ and C^h give the positive orientation of M. We put

$$\xi^h=B_a{}^h v^a+\lambda C^h, \tag{1.8}$$

then we have

$$g_{cb}\eta^c \eta^b=1-\lambda^2, \tag{1.9}$$

where $\eta^c=g^{cb}\eta_b$, from which, we see that the contravariant components γ^{cb} of the metric γ are given by

$$\gamma^{cb}=g^{cb}+\frac{1}{\lambda^2}\eta^c \eta^b. \tag{1.10}$$

Denoting the inverse matrix of the matrix $\begin{pmatrix} B_a{}^k \\ C^k \end{pmatrix}$ by $(B^a{}_k, C_k)$, the following relations are well known.

(1.11) $$B_a{}^k B^b{}_k=\delta_a{}^b, \quad B_a{}^k C_k=0, \quad B^a{}_k C^k=0, \quad C_k C^k=1,$$

(1.12) $$B_a{}^k B^a{}_j + C^k C_j = \delta_j{}^k,$$

(1.13) $$g_{cb} B^c{}_k = g_{kj} B_b{}^j, \quad g^{bc} B_c{}^k = g^{kj} B^b{}_j.$$

We denote by $K_{cba}{}^d$ the curvature tensor of the Levi-Civita connection formed with g_{cb} and by $R_{cba}{}^d$ the curvature tensor of the connection formed with γ_{cb}. In this case, the equation of Gauss of $i(\overline{M})$ in M is given by

(1.14) $$K_{cbad}=K_{kjih}B_c{}^k B_b{}^j B_a{}^i B_d{}^h + (h_{cd}h_{ba}-h_{bd}h_{ca}),$$

where $K_{cbad}=K_{cba}{}^e g_{ed}$, $K_{kjih}=K_{kji}{}^t g_{th}$ and h_{cb} is the second fundamental tensor of $i(\overline{M})$, $K_{kji}{}^h$ being the curvature tensor of the connection formed with g_{ji} of M.

§ 2. Bochner curvature tensor of a transversal hypersurface of a Sasakian manifold.

In this section we consider the Bochner curvature tensor of a transversal hypersurface $i(\overline{M})$ of a Sasakian manifold M.

In a Sasakian manifold $M(\varphi_j{}^h, \xi^h, \eta_j, g_{ji})$, we have

(2.1) $$\nabla_k \varphi_j{}^h = -g_{kj}\xi^h + \delta_k^h \eta_j,$$

(2.2) $$\nabla_k \xi^h = \varphi_k{}^h,$$

where ∇_k is the operator of covariant differentiation with respect to g_{ji} of M.

In the previous paper [3], we verified the fact that the almost Hermitian structure (F, γ) introduced in a transversal hypersurface $i(\overline{M})$ of a Sasakian manifold M is Kaehlerian. For a transversal hypersurface $i(\overline{M})$ of a Sasakian manifold M, we also verified in the previous paper the fact that

$$R_{cbad}-(\gamma_{cd}\gamma_{ba}-\gamma_{bd}\gamma_{ca}+F_{cd}F_{ba}-F_{bd}F_{ca}-2F_{cb}F_{ad})$$
$$=(K_{cbad}-h_{cd}h_{ba}+h_{bd}h_{ca})-(g_{cd}g_{ba}-g_{bd}g_{ca}).$$

Applying the equation of Gauss of $i(\overline{M})$ in M, we obtain, from above equation,

(2.3) $$R_{cbad}-(\gamma_{cd}\gamma_{ba}-\gamma_{bd}\gamma_{ca}+F_{cd}F_{ba}-F_{bd}F_{ca}-2F_{cb}F_{ad})$$
$$=(K_{kjih}-g_{kh}g_{ji}+g_{jh}g_{ki})B_c{}^k B_b{}^j B_a{}^i B_d{}^h,$$

where $R_{cbad}=R_{cba}{}^e\gamma_{ed}$.

We now consider the so-called contact Bochner curvature tensor [5] in a Sasakian manifold defined by

$$
\begin{aligned}
B_{kji}{}^{h}=K_{kji}{}^{h}&+(\delta_k^h-\eta_k\xi^h)L_{ji}-(\delta_j^h-\eta_j\xi^h)L_{ki}\\
&+L_k{}^h(g_{ji}-\eta_j\eta_i)-L_j{}^h(g_{ki}-\eta_k\eta_i)\\
&+\varphi_k{}^hM_{ji}-\varphi_j{}^hM_{ki}+M_k{}^h\varphi_{ji}-M_j{}^h\varphi_{ki}\\
&-2(M_{kj}\varphi_i{}^h+\varphi_{kj}M_i{}^h)+(\varphi_k{}^h\varphi_{ji}-\varphi_j{}^h\varphi_{ki}-2\varphi_{kj}\varphi_i{}^h),
\end{aligned}
\tag{2.4}
$$

where

$$L_{ji}=-\frac{1}{2(n+2)}[K_{ji}+(L+3)g_{ji}-(L-1)\eta_j\eta_i], \tag{2.5}$$

$$K_{ji}=K_{tji}{}^{t},\qquad L_k{}^h=L_{kt}g^{th}, \tag{2.6}$$

$$M_{ji}=-L_{jt}\varphi_i{}^t,\qquad M_k{}^h=M_{kt}g^{th}, \tag{2.7}$$

and

$$L=g^{ji}L_{ji}=-\frac{K+2(3n+2)}{4(n+1)},\qquad K=K_{ji}g^{ji}. \tag{2.8}$$

Since the structure (F,γ) introduced in a transversal hypersurface $i(\overline{M})$ of a Sasakian manifold is Kaehlerian [3], the Bochner curvature tensor of $i(\overline{M})$ is defined by [4]

$$
\begin{aligned}
B_{cba}{}^{d}=R_{cba}{}^{d}&+\delta_c^dL_{ba}-\delta_b^dL_{ca}+\gamma_{ba}L_c{}^d-\gamma_{ca}L_b{}^d\\
&+F_c{}^dM_{ba}-F_b{}^dM_{ca}+M_c{}^dF_{ba}-M_b{}^dF_{ca}\\
&-2(M_{cb}F_a{}^d+F_{cb}M_a{}^d),
\end{aligned}
\tag{2.9}
$$

where

$$L_{bc}=-\frac{1}{2(n+2)}\left(R_{bc}-\frac{R}{4(n+1)}\gamma_{bc}\right),\qquad L_b{}^a=L_{bc}\gamma^{ca}, \tag{2.10}$$

$$R_{bc}=R_{abc}{}^{a},\qquad R=R_{bc}\gamma^{bc}, \tag{2.11}$$

and

$$M_{bc}=-L_{ba}F_c{}^a,\qquad M_b{}^a=M_{bc}\gamma^{ca}. \tag{2.12}$$

We now compute $B_c{}^kB_b{}^jB_a{}^iB_d{}^hB_{kjih}$, where $B_{kjih}=B_{kji}{}^tg_{th}$.

The equation (2.4) can be written in the covariant form:

$$
\begin{aligned}
B_{kjih}=K_{kjih}&+(g_{kh}-\eta_k\eta_h)L_{ji}-(g_{jh}-\eta_j\eta_h)L_{ki}\\
&+L_{kh}(g_{ji}-\eta_j\eta_i)-L_{jh}(g_{ki}-\eta_k\eta_i)\\
&+\varphi_{kh}M_{ji}-\varphi_{jh}M_{ki}+M_{kh}\varphi_{ji}-M_{jh}\varphi_{ki}\\
&-2(M_{kj}\varphi_{ih}+\varphi_{kj}M_{ih})+(\varphi_{kh}\varphi_{ji}-\varphi_{jh}\varphi_{ki}-2\varphi_{kj}\varphi_{ih}).
\end{aligned}
\tag{2.13}
$$

Transvecting (2.3) with γ^{cd} and taking account of (1.7), (1.10) $-$(1.13) and the fact that $C_k\xi^k=\lambda$, we obtain

$$\begin{aligned} &R_{ba}-2(n+1)\gamma_{ba}+(2n-1)g_{ba}+\frac{1}{\lambda^2}(\eta_c\eta^c)g_{ba}-\frac{1}{\lambda^2}\eta_b\eta_a \\ &=K_{ji}B_b{}^jB_a{}^i+\frac{1}{\lambda^2}K_{kjih}\xi^kB_b{}^jB_a{}^i\xi^h-\frac{1}{\lambda}K_{kjih}B_b{}^jB_a{}^i(C^k\xi^h+\xi^kC^h). \end{aligned} \tag{2.14}$$

On the other hand, from (2.2) and the Ricci identity, we obtain

$$-K_{kjih}\xi^h=g_{ki}\eta_j-g_{ji}\eta_k, \tag{2.15}$$

from which

$$K_{kjih}\xi^h\xi^k=g_{ji}-\eta_j\eta_i. \tag{2.16}$$

Substituting (2.15) and (2.16) into (2.14) and taking account of (1.11) and the fact that

$$\eta_c\eta^c=1-\lambda^2 \tag{2.17}$$

which is obtained from (1.9) and $\eta^a=\xi^kB^a{}_k$, we have

$$R_{ba}-2(n+1)\gamma_{ba}+2ng_{ba}=K_{ji}B_b{}^jB_a{}^i, \tag{2.18}$$

from which

$$R_{ba}+2n\eta_b\eta_a-2\gamma_{ba}=K_{ji}B_b{}^jB_a{}^i \tag{2.19}$$

by the help of (1.7).

Transvecting (2.19) with γ^{ba} and taking account of (1.10)$-$(1.13) and (2.17), we obtain

$$R-4n+\frac{2n}{\lambda^2}(1-\lambda^2)=K+\frac{1}{\lambda^2}K_{ji}\xi^j\xi^i-\frac{2}{\lambda}K_{ji}C^j\xi^i, \tag{2.20}$$

where $R=R_{ba}\gamma^{ba}$.

Transvecting (2.15) with g^{ji}, we obtain

$$K_{kh}\xi^h=2n\eta_k. \tag{2.21}$$

Substituting (2.21) into (2.20) and taking account of $\eta_jC^j=\lambda$, we obtain

$$R-2n=K. \tag{2.22}$$

Transvecting (2.5) with $B_b{}^jB_a{}^i$ and substituting (2.19) and (2.22), we obtain

$$B_b{}^jB_a{}^iL_{ji}=L_{ba}-\eta_b\eta_a, \tag{2.23}$$

where

$$(2.24)\qquad L_{ba}=-\frac{1}{2(n+2)}\left[R_{ba}-\frac{R}{4(n+1)}\gamma_{ba}\right].$$

On the other hand, transvecting (2.5) with ξ^i, we get

$$(2.25)\qquad -L_{jt}\xi^t=\eta_j.$$

Transvecting φ_{ji} with $B_b{}^jB_a{}^i$ and taking account of (1.3), (1.4) and (1.7), we have

$$(2.26)\qquad B_b{}^jB_a{}^i\varphi_{ji}=F_{ba}.$$

Transvecting (2.7) with $B_b{}^jB_a{}^i$ and taking account of (1.4), (2.23) and (2.26), we obtain

$$(2.27)\qquad B_b{}^jB_a{}^iM_{ji}=M_{ba},$$

where

$$(2.28)\qquad M_{ba}=-L_{bt}F_a{}^t.$$

Transvecting (2.13) with $B_c{}^kB_b{}^jB_a{}^iB_d{}^h$ and taking account of (2.3), (2.23), (2.26) and (2.27), we obtain

$$(2.29)\qquad B_c{}^kB_b{}^jB_a{}^iB_d{}^hB_{kjih}=B_{cbad},$$

where $B_{cbad}=B_{cba}{}^e\gamma_{ed}$.

Thus we have the following

THEOREM 2.1. *The contact Bochner curvature tensor of a Sasakian manifold M and the Bochner curvature tensor of a transversal Kaehlerian hypersurface of M are related by* (2.29).

THEOREM 2.2. *If the contact Bochner curvature tensor of a Sasakian manifold M vanishes, then the Bochner curvature tensor of a transversal Kaehlerian hypersurface of M also vanishes.*

§3. Cosymplectic Bochner curvature tensor of a cosymplectic manifold.

An almost contact metric manifold $M(\varphi_j{}^h, \xi^h, \eta_j, g_{kj})$ is said to be cosymplectic if the 2-form $\Phi_{ji}=\varphi_j{}^hg_{hi}$ and the 1-form η_j are both closed. It is known [1] that the cosymplectic structure is characterized by

$$(3.1)\qquad \nabla_k\varphi_j{}^h=0,\quad \nabla_k\xi^h=0,$$

where ∇_k is the operator of covariant differentiation with respect to g_{ji} of M.

We verified in the previous paper [3] the fact that the almost Hermitian structure (F,γ) introduced in a transversal hypersurface $i(\overline{M})$ of a cosymplectic manifold M is Kaehlerian.

For a transversal hypersurface $i(\overline{M})$ of a cosymplectic manifold M, we also verified in the previous paper [3] that

$$R_{cba}{}^{d}=(K_{cbae}-h_{ce}h_{ba}+h_{be}h_{ca})\gamma^{ed}.$$

Thus we have

$$R_{cbad}=K_{cbad}-(h_{cd}h_{ba}-h_{bd}h_{ca}), \tag{3.2}$$

where $R_{cbad}=R_{cba}{}^{e}\gamma_{ed}$ and $K_{cbad}=K_{cba}{}^{e}\gamma_{ed}$.

Substituting (3.2) into (1.14), we obtain

$$R_{cbad}=K_{kjih}B_{c}{}^{k}B_{b}{}^{j}B_{a}{}^{i}B_{d}{}^{h}. \tag{3.3}$$

In §2, we proved that the contact Bochner curvature tensor B_{kjih} of a Sasakian manifold M and the Bochner curvature tensor of a transversal hypersurface of M are related by (2.29), that is,

$$B_{c}{}^{k}B_{b}{}^{j}B_{a}{}^{i}B_{d}{}^{h}B_{kjih}=B_{cbad}.$$

In relation to this fact, we are now going to certify in a cosymplectic manifold M the existence of a tensor $\overline{B}_{kjih}$ satisfying the relation

$$B_{c}{}^{k}B_{b}{}^{j}B_{a}{}^{i}B_{d}{}^{h}\overline{B}_{kjih}=B_{cbad}, \tag{*}$$

where B_{cbad} is the Bochner curvature tensor of a transversal Kaehlerian hypersurface of M.

The purpose of this section is to seek out the form of the components of a tensor $\overline{B}_{kjih}$.

The Bochner curvature tensor $B_{cba}{}^{d}$ of a transversal Kaehlerian hypersurface $i(\overline{M})$ of a cosymplectic manifold M is defined by (2.9).

Transvecting (3.3) with γ^{cd} and taking account of (1.10)-(1.13), we obtain

$$R_{ba}=(B^{c}{}_{l}B^{d}{}_{m}g^{lm}+\frac{1}{\lambda^{2}}B^{c}{}_{l}B^{d}{}_{m}\xi^{l}\xi^{m})B_{c}{}^{k}B_{b}{}^{j}B_{a}{}^{i}B_{d}{}^{h}K_{kjih}, \tag{3.4}$$

where we have used the relation

$$\eta^{a}=\xi^{k}B^{a}{}_{k}. \tag{3.5}$$

Taking account (1.12) and the fact that $C_{k}\xi^{k}=\lambda$, we obtain from (3.4),

$$R_{ba}=K_{ji}B_{b}{}^{j}B_{a}{}^{i}+\frac{1}{\lambda^{2}}\Big[\xi^{k}\xi^{h}-\frac{1}{\lambda}(C^{k}\xi^{h}+C^{h}\xi^{k})\Big]B_{b}{}^{j}B_{a}{}^{i}K_{kjih}. \tag{3.6}$$

On the other hand, using (3.1) and the Ricci identity:

$$\nabla_k\nabla_j\eta_i-\nabla_j\nabla_k\eta_i=-K_{kji}{}^h\eta_h,$$

we obtain

(3.7) $$K_{kji}{}^h\eta_h=0,$$

from which,

(3.8) $$K_{kj}\xi^k=0.$$

Substituting (3.7) into (3.6), we obtain

(3.9) $$R_{ba}=K_{ji}B_b{}^jB_a{}^i.$$

Transvecting (3.9) with γ^{ba} and taking account of (1.7), (1.10)-(1.13) and (3.8), we obtain

(3.10) $$R=K=K_{ji}g^{ji}.$$

Taking account of (1.5), (1.7), (2.10), (3.9) and (3.10), we obtain

(3.11) $$B_b{}^jB_a{}^iL_{ji}=L_{ba},$$

where

(3.12) $$L_{ji}=-\frac{1}{2(n+2)}\Big[K_{ji}+L(g_{ji}-\eta_j\eta_i)\Big],$$

and

(3.13) $$L=L_{ji}g^{ji}=-\frac{K}{4(n+1)},\qquad K=K_{ji}g^{ji}.$$

Transvecting (3.12) with ξ^i and taking account of (3.8), we obtain

(3.14) $$L_{ji}\xi^i=0.$$

On the other hand, transvecting φ_{ji} with $B_b{}^jB_a{}^i$ and taking account of (1.3), (1.4) and (1.7) we have

(3.15) $$B_b{}^jB_a{}^i\varphi_{ji}=F_{ba},$$

where $F_{ba}=F_b{}^c\gamma_{ca}$.

By the help of (2.12), (3.11) and (3.15), we obtain

(3.16) $$B_b{}^jB_a{}^iM_{ji}=M_{ba},$$

where

(3.17) $$M_{ji}=-L_{jt}\varphi_i{}^t.$$

Taking account of (3.3), (3.11), (3.15) and (3.16), we obtain

$$B_c{}^k B_b{}^j B_a{}^i B_d{}^h [K_{kjih} + (g_{kh} - \eta_k\eta_h) L_{ji} - (g_{jh} - \eta_j\eta_h) L_{ki}$$
$$+ L_{kh}(g_{ji} - \eta_j\eta_i) - L_{jh}(g_{ki} - \eta_k\eta_i)$$
$$+ \varphi_{kh} M_{ji} - \varphi_{jh} M_{ki} + M_{kh}\varphi_{ji} - M_{jh}\varphi_{ki} \tag{3.18}$$
$$- 2(M_{kj}\varphi_{ih} - \varphi_{kj}M_{ih})]$$
$$= B_{cbad}.$$

Thus we have the following

THEOREM 3.1. *There exists a tensor $\bar{B}_{kjih}$ satisfying the relation* (*) *in a cosymplectic manifold M* (*dim.* $M=2n+1$), *and the components of $\bar{B}_{kjih}$ are given by the following*:

$$\bar{B}_{kjih} = K_{kjih} + (g_{kh} - \eta_k\eta_h) L_{ji} - (g_{jh} - \eta_j\eta_h) L_{ki}$$
$$+ L_{kh}(g_{ji} - \eta_j\eta_i) - L_{jh}(g_{ki} - \eta_k\eta_i)$$
$$+ \varphi_{kh} M_{ji} - \varphi_{jh} M_{ki} + M_{kh}\varphi_{ji} - M_{jh}\varphi_{ki}$$
$$- 2(M_{kj}\varphi_{ih} + \varphi_{kj}M_{ih}),$$

where

$$L_{ji} = -\frac{1}{2(n+2)}[K_{ji} + L(g_{ji} - \eta_j\eta_i)], \qquad L_j{}^h = L_{jt}g^{th},$$

$$L = L_{ji}g^{ji} = -\frac{K}{4(n+1)}, \qquad K = g^{ji}K_{ji},$$

$$M_{ji} = -L_{jt}\varphi_i{}^t \quad \text{and} \quad M_j{}^h = M_{jt}g^{th}.$$

We call such a tensor $\bar{B}_{kjih}$ the *cosymplectic Bochner curvature tensor* of a cosymplectic manifold. Thus we have the following

THEOREM 3.2. *If the cosymplectic Bochner curvature tensor of a cosymplectic manifold M vanishes, then the Bochner curvature tensor of a transversal Kaehlerian hypersurface of M also vanishes.*

References

[1] D.E. Blair, *The theory of quasi-Sasakian structure*, Journal of Differential Geometry, **1** (1967), 331-345.
[2] S.S. Eum, *On cosymplectic conformal connections*, to appear.
[3] K. Yano, S.S. Eum and U-H. Ki, *On transversal hypersurfaces of an almost contact manifold*, Kōdai Math. Sem. Rep., **24** (1972), 459-470.
[4] K. Yano, *On complex conformal connections*, Kōdai Math. Sem. Rep., **26** (1975), 137-151.
[5] K. Yano, *On contact conformal connections*, Kōdai Math. Sem. Rep., **28** (1976), 90-103.

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