

Scientific Report of the Researcher Rui Albuquerque

(Short visit grant ref. 4368)

The purpose of the visit to Sofia's University was the study of Gwistor space. As explained in the document "Project work", we aimed for the interaction with Professor Stefan Ivanov and his renowned ideas about special Riemannian geometries.

Professor Stefan Ivanov is a leading expert which, in particular, has passed a few occasions in Spain, involved in research visits. We have met him at least three times in important conferences in Spain¹. It was thence an honour for us to visit him in his home University. He has worked on several different Riemannian geometries with special structures, namely Hermitian, Kähler, special unitary, quaternionic-Kähler, contact and quaternionic-contact structures, G_2 , Spin(7). Also, of course, he has worked in pseudo-Riemannian geometry. Recently he developed many tools and important results within the theory of metric connections with torsion (in collaboration with Prof Thomas Friedrich, with whom we have interacted previously during our Sabbatical Leave in Marburg regarding Gwistor spaces). In particular, the so called characteristic connection, in our context, is a metric connection with curvature, i.e. holonomy, inside G_2 and skew-symmetric torsion, which may have important consequences for the study of our manifold: it exists always if the G_2 -structure is cocalibrated. It is also unique. The holonomy in the context of Gwistor space is still to be deduced.

During the short visit to "St. Kliment Ohridski University" and in particular to Prof Stefan Ivanov's department, we had the opportunity to discuss:

- the construction of Gwistor space on $SM \rightarrow M$ (recall M is a given oriented Riemannian 4-manifold, as explained in "Project work", and SM is its unit tangent sphere bundle, which carries a natural G_2 structure, the so-called gwistor structure) and its developments. Firstly the analogous construction of a G_2^\sim -structure using the model of the split octonions, based on this ring with compatible metric with signature (4,4), which carries over to SM as a (4,3)-metric and a split- G_2 structure (G_2^\sim is the non-compact dual of G_2). Secondly, we treated the extension of the natural gwistor structure to a Spin(7)-structure on $TM \setminus 0$. Hopefully we shall be able to study a Sp(2)-structure on the whole of TM .
- the special Lagrangian geometry of gwistor space and its applications within exterior differential systems.

¹ 1 June 2001, "New interfaces between Geometry and Physics", Miraflores de la Sierra, Spain. September 2005, "XIV Fall Workshop on Geometry and Physics", Bilbao, Spain. 4 to 8 September 2006, "Geometry Conference in honour of Nigel Hitchin", satellite conference of ICM, Consejo Superior de Investigaciones Científicas, Madrid.

Financial Report

As documented with the electronic flight ticket, the trip to Sofia of the Researcher Rui Albuquerque started on the 18th of September and ended on the 28th. The ticket cost was 368,43 euro (including a 10,00 euro insurance, as described in the receipt). The traveller used a taxi in several moments for his dislocations in the city of Sofia. Noteworthy the transport from Sofia's airport to the city centre, and return, add to the amount of 42 euro (84 Leva, the Bulgarian currency). We believe the total expenses with transportation exceed 450 euro.

TP TAP PORTUGAL
A STAR ALLIANCE MEMBER

CLASS: SEAT:
Y 8B

ALBUQUERQUE/RUI MR
TP 2694 18SEP
FROM: LISBON/LIS
TO: VIENNA/VIE
DEPARTURE TIME: **13:00**

^{1/16KG}SEQUENCE NO: **113**
ETKT 12572961715250

TP TAP PORTUGAL
A STAR ALLIANCE MEMBER

CLASS: SEAT:
M 22A

ALBUQUERQUE/RUI MR
OS 799 18SEP
FROM: VIENNA/VIE
TO: SOFIA/SOF
DEPARTURE TIME: **20:25**

^{1/16KG}SEQUENCE NO: **35**
ETKT 22572961715250

ECONOMY 089

NAME OF PASSENGER **DOC**
ALBUQUERQUE/RUIMR
ETKT 257 2961715250
FROM **SOF**
TO **MUC**
LUFTHANSA
FLIGHT CLASS DATE TIME
LH 1705 S 28SEP

GATE	BOARDING TIME	SEAT	SMOKE
B08	1610	25F	NONSMOKER

01 **swissport** 

ECONOMY 107

NAME OF PASSENGER
ALBUQUERQUE/RUIMR
ETKT 257 2961715250
FROM **MUC**
TO **LIS**
LUFTHANSA
FLIGHT CLASS DATE TIME
LH 1792 S 28SEP

GATE	BOARDING TIME	SEAT	SMOKE
G26	1910	22F	NONSMOKER

01 **swissport** 

Netviagens, Agência de Viagens e Turismo SA
Av. D. João II - Lote 1.16.1 - 11º Andar
1990-083 Lisboa
www.netviagens.com netviagens@netviagens.com
tel:+351 21 893 80 40 Fax: +351 21 893 80 49
nif: 504518755

Venda a dinheiro / Receipt NV.2011.0010917

Rui Albuquerque
rua da cruz vermelha nº13 2ºDtº
Lisboa
1600 Lisboa

N. Conta / Account : 156553
File : 922087
Emitido por / Issued by : Patricia Pereira
Data Liquidação / : 08-08-2011
Payment due Until

Original

NIF / VAT nr:
Data de emissão / Issued: Lisboa, 08-08-2011

Designação / Description	Valor / Value
Passagem Aérea (LIS-VIE-SOF-MUC-LIS) Austrian Airlines,Lufthansa, de 2011/09/18 a 2011/09/28 - Rui Albuquerque	165.00 € 1)
Seguros - Base de 2011/09/18 a 2011/09/28 - Rui Albuquerque	10.00 € 1)
Taxas de Aeroporto	182.43 € 1)
TASF Aviação Internacional (desp Serviço)	11.00 € 1)
Total:	368.43 €

Câmbio / Exchange Rate: 1,00 € = 1.00000 EUR

HfQq-Processado por Programa Certificado nº 465/DGCI

1) Isento IVA art14nº1r

CERTIFICADO DE SEGURO – Apólice: 0002059649

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Pessoa segura: Rui Albuquerque
Data Início: 18-09-2011
Data Fim: 28-09-2011
Destino: SOFIA
Número File: 922087
Cobertura: Base

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Data: 8/8/2011
Patricia Pereira

De Portugal marque: 21 383 55 80

Do estrangeiro marque: + 351 21 383 55 80

Número de fax : 21 386 33 14 precedido de +351 a partir do estrangeiro

E-mail : assistencia24H@eap.pt

Indique com clareza: Nome da pessoa segura / seguro comprado na Netviagens SA / Tipo de assistência pretendida / Local exacto onde se encontra / Número de telefone de contacto.

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Vendor Locator:	1A*6KSXSX	Issued by:	Austrian Airlines
File Netviagens nr:	922087/2011	Place of issue:	Lisboa/PT

18-09-2011	Flight/Voo: OS 8156	Baggage/Bagagem: 1P	CL: T	OK
Departure/Partida: 13:00	(LIS) Lisboa			
Arrival/Chegada: 17:25	(VIE) Viena			
Not Valid Before: 18-09-2011	Not Valid After: 18-09-2011			

18-09-2011	Flight/Voo: OS 799	Baggage/Bagagem: 1P	CL: T	OK
Departure/Partida: 20:25	(VIE) Viena			
Arrival/Chegada: 23:00	(SOF) SOFIA			
Not Valid Before: 18-09-2011	Not Valid After: 18-09-2011			

28-09-2011	Flight/Voo: LH 1705	Baggage/Bagagem: 1P	CL: S	OK
Departure/Partida: 16:35	(SOF) SOFIA			
Arrival/Chegada: 17:35	(MUC) Munique			
Not Valid Before: 28-09-2011	Not Valid After: 28-09-2011			

28-09-2011	Flight/Voo: LH 1792	Baggage/Bagagem: 1P	CL: S	OK
Departure/Partida: 19:35	(MUC) Munique			
Arrival/Chegada: 21:45	(LIS) Lisboa			
Not Valid Before: 28-09-2011	Not Valid After: 28-09-2011			

FARE: EUR 165.00 TAX: 4.03PT 7.97YP 4.00AT 17.39ZY 12.31BG 15.73RA 121.00YQ TOTAL: EUR 347.43

FORM OF PAYMENT: CASH

NONREF/CHANGE EUR 50/NONREF/F / L/CHG RESTRICTED

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